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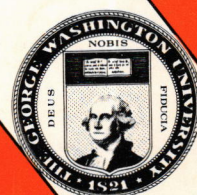
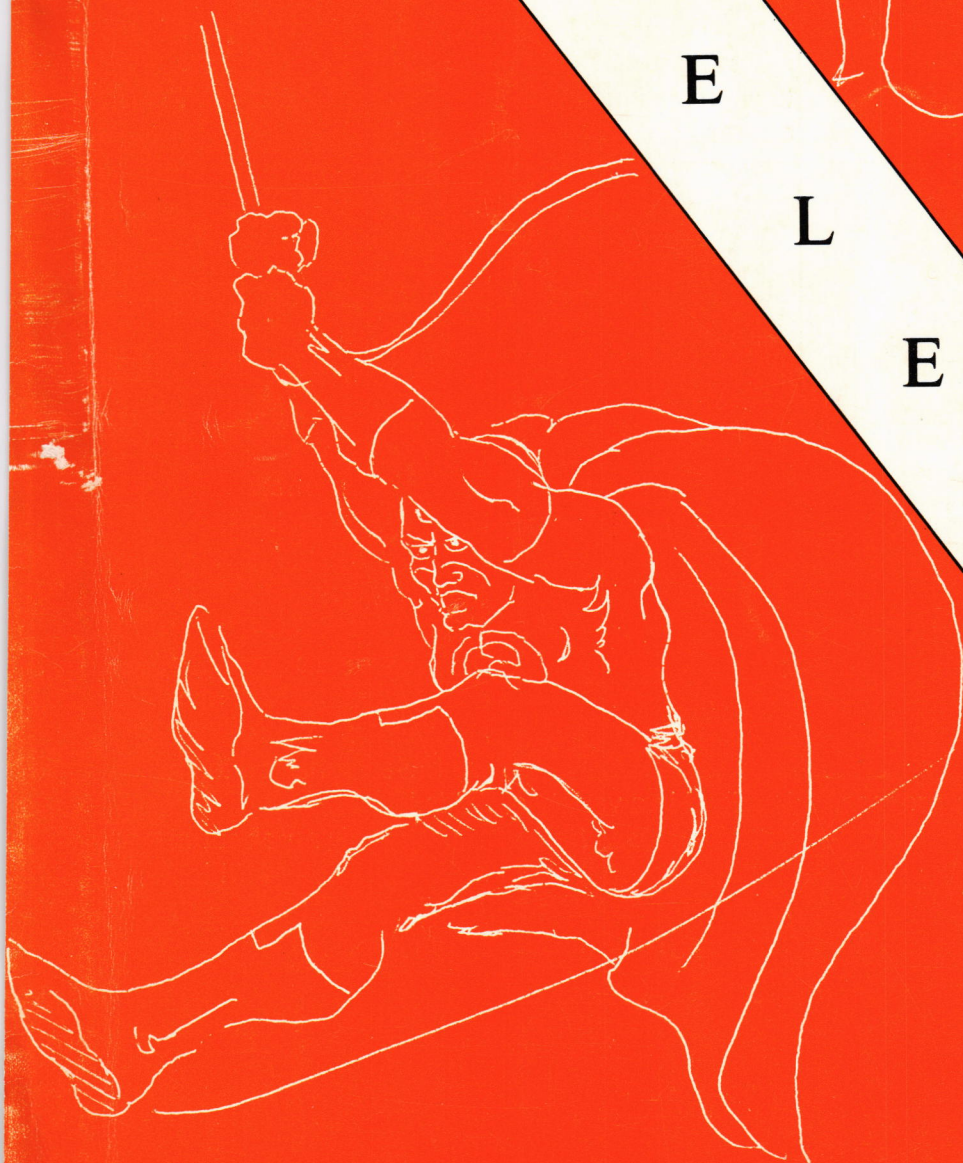
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SCHOOL OF ENGINEERING APPLIED SCIENCE

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**"They encourage us to
look for original solutions
to problems. This
sparks inventiveness."**

Bill Greiner, Western Electric

Bill Greiner's problem: shaving 10-14 seconds off one operation in the manufacture of integrated circuits, while reducing error factor below .001 inch.

Bill is a staff member at Western Electric's Engineering Research Center, working primarily with the handling and testing of integrated circuits.

Bill came to Western Electric in 1968 after receiving his MS from MIT. He earned his BS in Mechanical Engineering at Yale.

"My work here has given me a better appreciation of the problems in manufacturing," said Bill. His automatic TV system for the alignment of integrated circuits is a good example.

At one phase of the manufacturing process, operators must correct alignment of integrated circuits by hand—a job that took up to fifteen seconds, and was accurate to only .001 inch in x and y, and to one degree in rotary.

What Bill did, essentially, was design and build a small dedicated computer that completely automates the process. An operator can push a button to align the integrated circuits automatically. A TV camera enlarges the image in silhouette form, scans the pattern, and feeds the voltage signal into Bill's computer. The computer calculates the position measurements and triggers a stepping table to correct the alignment.

The correction time is reduced to one second, the error factor to .00025 inch in x and y, and 1/2 degree in rotary.

Bill finds the challenge of electronics and logic design extremely stimulating. "We're not channeled: we have a chance to get

involved in a variety of fields."

What does he find most satisfying about his job at Western Electric? "Well," said Bill, "I look for an amount of responsibility. And here I'm encouraged to take it."



Western Electric

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MECHELECIV

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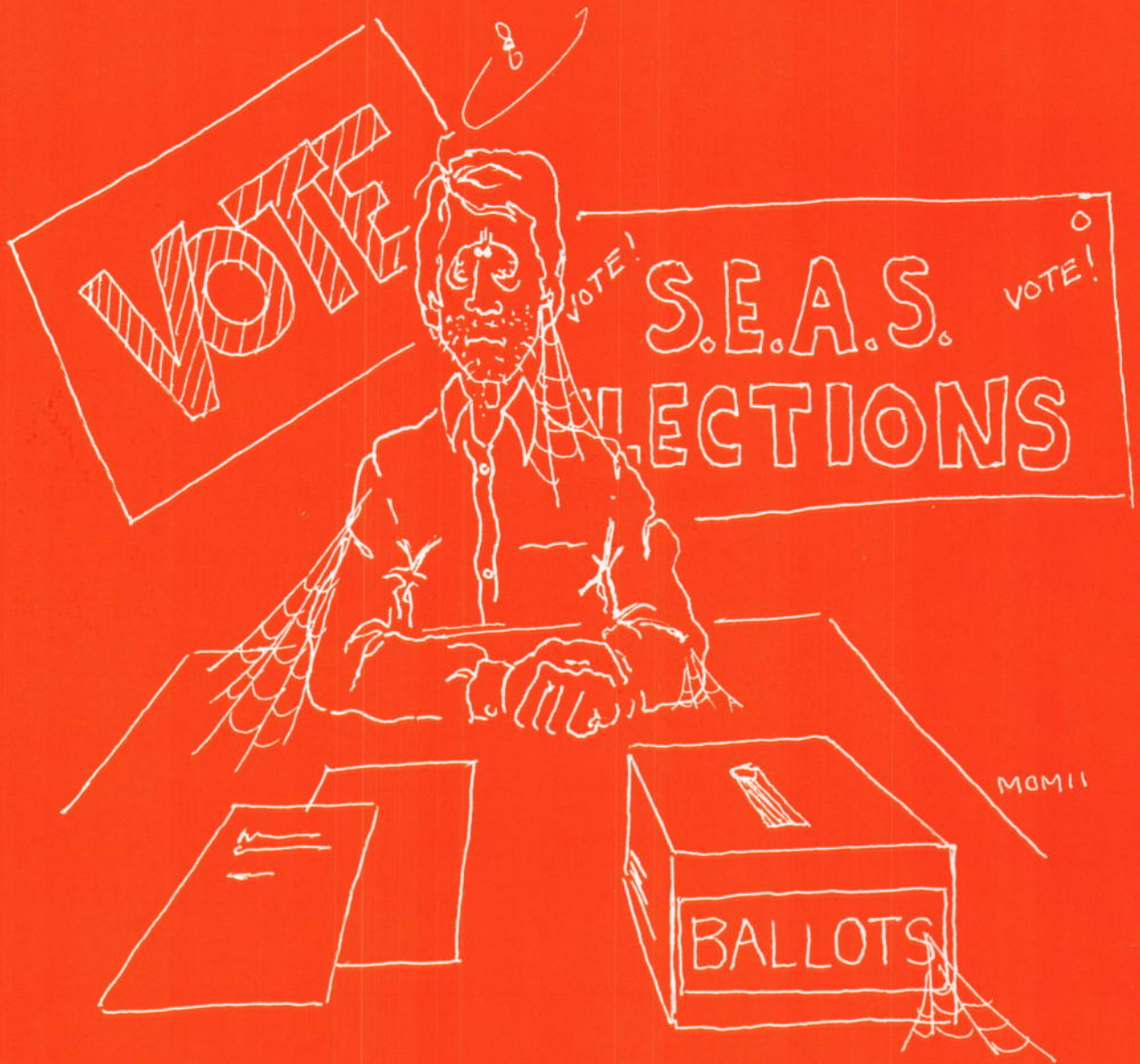
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MECHELECIV

During the second week in March, the Engineers' Council held elections for the forthcoming year. Of the 12 positions available to candidates, only six were filed for. Of these six positions on the ballot, only two of them were contested. Considering these statistics the following possible reasons for the obvious lack of interest in the student government of SEAS may be considered.

(1) Students no longer feel there is a need for representation in the School of Engineering and therefore didn't bother to run for any of the positions on the Engineers' Council since everything in the school is just perfect or the SEAS administration knows exactly the wants and desires of the students.

(2) Students do not enter into the Council elections because they believe that organized student government at SEAS is ineffective, and that they couldn't change the structure of it if they tried.

(3) The SEAS student body was rather "turned-off" by the performance of the last Council and have just plain given up and "dropped-out" until a brighter day.

(4) Advanced notification for the petitioning, and length of time that the nominations were held open was too short to get a proper student response.

In addition to the above possibilities, several more reasons could be stated, but I leave the rest of them to your own persuasive thought. If you wish to make a more detailed analysis of this political microcosm in distress, consider the following fact.

The number of students who voted in this election came to approximately 75 as opposed to 1400 students in SEAS, (1100 graduate students, 300 undergraduates). This, dear readers, is only 5.3 per cent of the entire engineering student body.

Greg C. Eichert
Editor

LETTERS TO THE EDITOR

SENIOR EE LABS

Dear Editor:

The senior project lab in Electrical Engineering attempts to provide an answer to one of the major shortcomings of the four-year curriculum. That is, a course where the student can apply his theoretical skills toward a design project of his choice. If each student has sufficient time and supervision to develop his project, the lab indeed is a worthwhile and strong addition to the E.E. curriculum.

This however is not the case. Unfortunately, under the present situation the senior project has been reduced to a long term homework assignment. There are seven labs plus the senior project. Students are so busy trying to meet completion dates that neither the labs nor the senior project are accomplishing their purpose. The senior project appears to suffer the most in that ultimately all too often the project will either be copied from a manual, or hurriedly done at the end of the semester.

What is the solution? Either allocate enough time to the senior project or do away with it. But a good senior project has such value that it must not be eliminated. I recommend that the necessary time be allocated, that this time come from reducing the present seven labs, and that the lab be expanded from two to three credit hours.

A meaningful senior project can provide an essential learning experience not available from any other course.

Michael Seijo

* * *

LETTER TO THE EDITOR POLICY. The opinions set forth in the "Letter to the Editor" page of this magazine are not necessarily the opinions of the staff of *Mecheleciv* magazine. This page is set aside each issue for use by students, alumni, faculty, and staff of the School of Engineering and Applied Science. The staff will also accept letters from other sources if the letters concern the magazine or would be of interest to the students, alumni, faculty, and staff of the S.E.A.S. *Mecheleciv* reserves the right to edit any letter if lack of space deems it necessary. If, in the opinion of the Editorial Staff of *Mecheleciv*, a letter appears to be unprintable, the staff reserves the right to return the letter to the sender stating the staff's reasons for withholding it from publication. All letters must be signed; however, pen names may be substituted if requested.

BEST TEACHER'S AWARD

Dear Editor:

I would like to address this letter especially to the New Council. The subject refers to the failure of the motion for a *Best Teacher's Award*, which was made at the March 18th Council Meeting. I do hope that the New Council reconsiders this topic and creates some type of yearly best teacher award. Unfortunately, the major emphasis in many universities is placed on research and publication. The professor who can ably communicate with his students in the classroom is rarely recognized. Although our award can not be remunerative, it is the duty of the Engineering students to indicate their appreciation and support for the professor, who has truly excelled in teaching.

Reda Teicher
Sec., 70-71 Engineers' Council

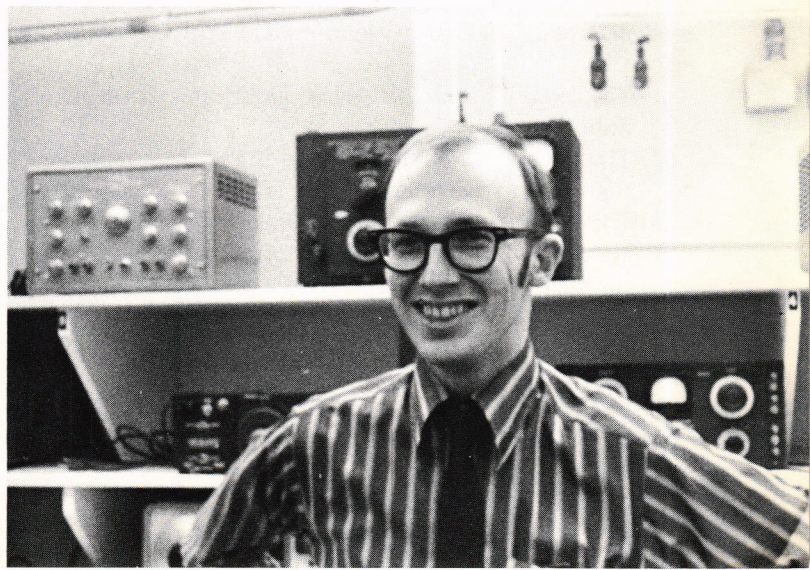
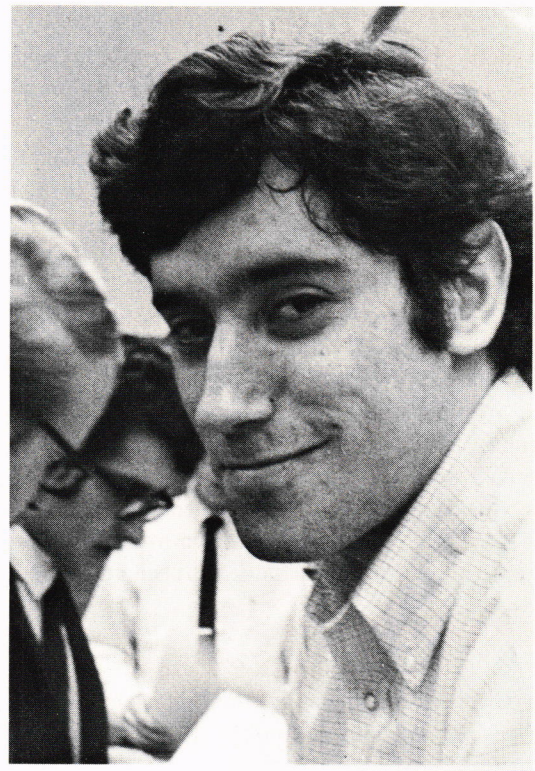
CHAUVINIST PIGS OF SEAS

Dear Editor:

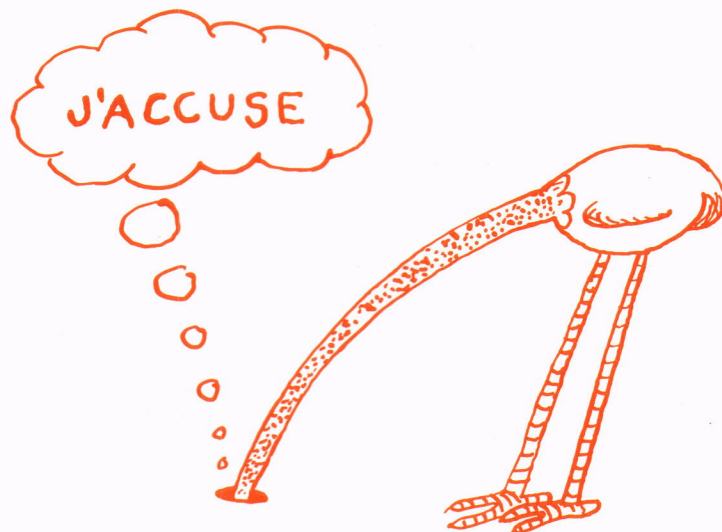
You don't realize the profound frustration I feel by being the only girl of the D-H House.

The fraternity group is another vicious display of male chauvinism. You all have a grudge against women? The only example of femininity or softness are the carpets and matching drapes in the living and study rooms. But in the remaining rooms, you all submerge yourselves in sterility of environment and in such pompous, raucous behavior. Therefore, I vehemently demand that a reliable member of the fraternity be given the responsibility to induce other campus women to visit the Engineers' quarters. How else can I discuss hot pants or midi skirts without drawing some lewd or snide remarks? This way, I'd have an ally equal to my aggressive capacity to stamp, squash, or otherwise dishevel any man who dares knock any fact of feminine fashion and/or character. Engineers-wise up! Eliminate this unjust segregation . . . or, I won't bring in any more brownies!

Adele Faust



THINK ABOUT IT — WON'T YOU?



PRESENT UNIVERSITY POLICY ON ACADEMIC DISHONESTY

The present University policy on the subject of academic dishonesty as stated in the University Bulletin 1970-1971 on pages 45 and 46 is as follows.

Academic dishonesty on the part of any student will result in a disciplinary grade of F for the course involved and also may, upon the recommendation of the appropriate dean's council, result in his suspension from the University for a stated period, at the end of which time he may petition for readmission. The disciplinary grade of "Failure—Academic Dishonesty" will be recorded for the course involved, and this grade will be employed in the computation of the quality-point index or academic standing. A student so suspended shall be withdrawn from all other courses except those in which all work has been completed.

THE HONOR SYSTEM

At a March eighteenth meeting, the Engineers' Council decided to take immediate action on cases of academic dishonesty.

Now it is time that the Council take measures which will aid in preventing academic dishonesty. A type of *Honor System* set up by the engineering students would serve as a good deterrent. An honor system would entail the following:

- 1) The establishment of what constitutes academic dishonesty.
- 2) The publication of these standards and their implications to the student body.
- 3) The encouragement to professors to alleviate the attractions to cheating — such as the practice of giving the same test year after year.
- 4) The elimination of crowded room situations.
- 5) The presence of a constant reminder of the honor system such as a pledge at the end of all exams.

This type of Honor System would promote a feeling of trust between the professor and the student since the overseers of the system would be the students and not the professors.

ENGINEERING PRIORITIES

The function of any Engineering School in this technological age is to not only provide future engineers with the data and examples of previous engineering problems, but also to prepare them technologically to cope with any problems society may create in the future. The engineering student must develop the means to decide priorities to determine which method will be able (or most advantageous) to cope with the situations of the real world.

Such priority decisions are for the most part *not* due to classes, exams, tests, or papers; they are the result of personal influences of teachers, advisors, alumni, and fellow students. When one realizes that most engineers will become aware of said means to decide priorities through personal influences, one should also realize the inadvisability of attempting to impress these ideals upon engineering students through the sole use of classes, exams, tests, or papers.

COMMENT ON U.S. WAR POLICY BY YALE PRESIDENT

Yale University President Kingman Brewster Jr. called U.S. policy in Southeast Asia morally callous because it shows "no concern for the sanctity of human life."

Addressing alumni, who gave him a standing ovation, Brewster said the reduction of American casualties, even the withdrawal of all American combat troops, does not mitigate what he called our moral responsibility for the spread of the war, the "indiscriminate bombing of neutrals, the scorching of forests and villages, and the massacre of innocents."

Brewster said the goal of American policy should be "peace," not "the Vietnamization of continuing American warfare." Vietnamization, according to Brewster, highlights "the moral cowardice of the assumption that the body count doesn't matter as long as they are not American bodies."

Urging participation in an antiwar teach-in, Brewster said, "Yale and all universities have a very special responsibility to be sure that we do not drift in a dead calm of moral acquiescence."

Brewster said he realized some alumni would disapprove of his comments because they may "constitute an unwarranted politicizing of the university." But, Brewster added, the heritage of this place, a heritage which we all share, demands that none of us by his silence contribute to the moral erosion of our nation."

AN EXERCISE IN STATICS AND DYNAMICS

It's wonderfully uplifting to learn that the Lovable Company, a bra manufacturer, is sponsoring a national brassiere designing contest, open to all U.S. engineering students.

Results aren't in yet, but the company has asked entrants to accompany their prototypes with "supportive engineering-design calculations which may range from slide-rule computations to elaborate studies employing digital-computer methods."

Lovable's chairman, Grek Eicert, was quoted in the Wall Street Journal as declaring that "the properties of the bust are unusual — and unlike those of most engineering materials. Designing a strapless bra or one for an unusually well-endowed girl," he said, "is a great engineering feat in itself." The contest rules inform prospective entrants that in bra design "the factors of safety are based upon uncertainties in the stress distribution, uncertainties in material properties, as well as the static or moving nature of the load." Field testing is not mentioned.

JONATHAN SWIFT IS ALIVE AND WELL AND LIVING IN TOMPKINS HALL

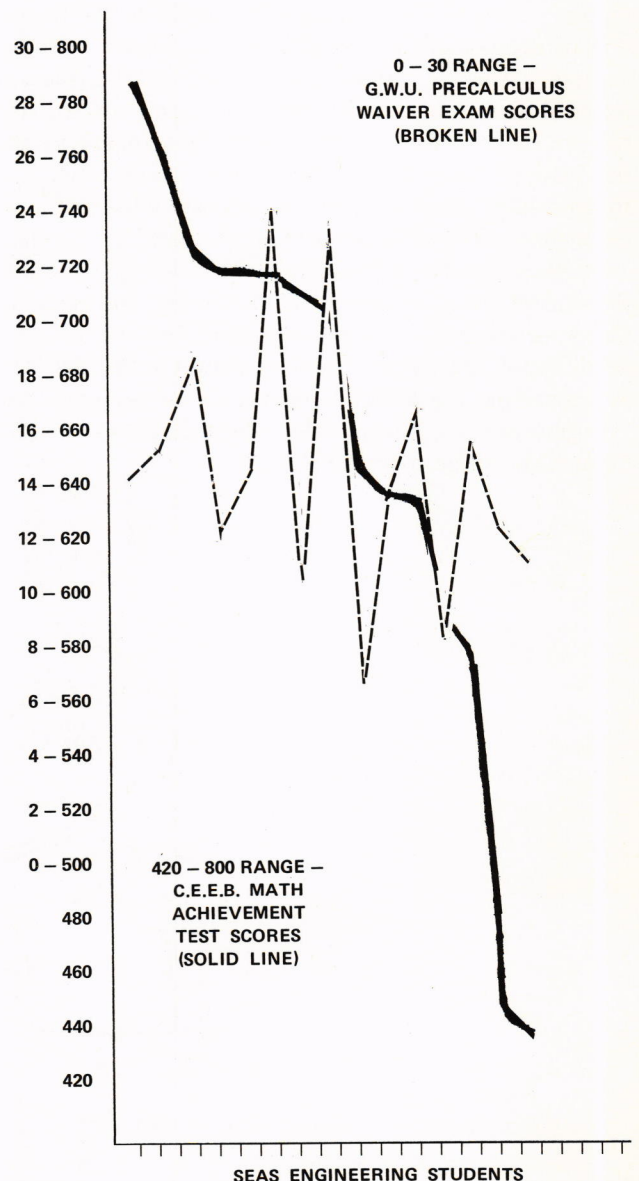
At first I didn't know why I really wanted to be a eng Other then that they make good money and carry lotts of wait. But after this class I realize that there is a lot of responsibility that goes along with the title. Not only to the Co. that I will work for but to society. I want to be a Mech. eng. because I like working with my hands and micheans. Now I know that it's not good enough to make something that just works, it also has to be safe an clean. Now that I have this new look on life I think I can make a good eng. for society. Maby I can think of something that will help the state that were in.

MARCH 1971

SEAS: TAKE NOTE

An interesting non-correlation is observed when SEAS student scores on their Mathematics Achievement test (administered by the College Entrance Examination Board — C.E.E.B.) are superimposed upon the same student scores on their Precalculus Waiver Examination (administered through the auspices of The George Washington University Mathematics Department). *see graph*

As long as the School of Engineering and Applied Science recognizes the English Composition Examination administered by the C.E.E.B. for placement in or waiver of the English requirement for engineering students, it would seem that placement in or waiver of part of the SEAS mathematics requirements would be more realistically



serving the interests of the SEAS by a similar policy adoption of C.E.E.B. Mathematics Achievement Test scores.

This policy adoption would not only place more engineering students in the proper mathematics course, but also would attract the more capable students with higher test scores to the SEAS — perhaps making possible the ideal of having a *minimum* C.E.E.B. combined Scholastic Achievement Test score of 1100, rather than the current SEAS *average* of 1115.

MATH DEPARTMENT

A basic in any engineering curriculum is a good math foundation. It is upon this foundation that more advanced study is built. A good math department, therefore, is a necessity. Considering the math department here at GW it is a wonder that the engineering school hasn't collapsed into the void created by that department. Much to the frustration of many students, as well as the professors, math has become a shackle, rather than a tool. Courses become remedial math courses rather than engineering courses. And the professors struggle to teach both the mathematics and the material intended for the course. As a result, the students either learn too little or lack an understanding of the material. This is not to say that the math department is completely at fault. Education is a two way process with the student giving, as well as the instructors. But when the instructor fails to stimulate the student, then the student is handicapped and will be unable to grasp the abstract ideas in engineering which rely so heavily on mathematics. And in engineering if a student fails to do so, he goes to that big Columbian college down the block.

Engineering Students

Join

MECHELECIV

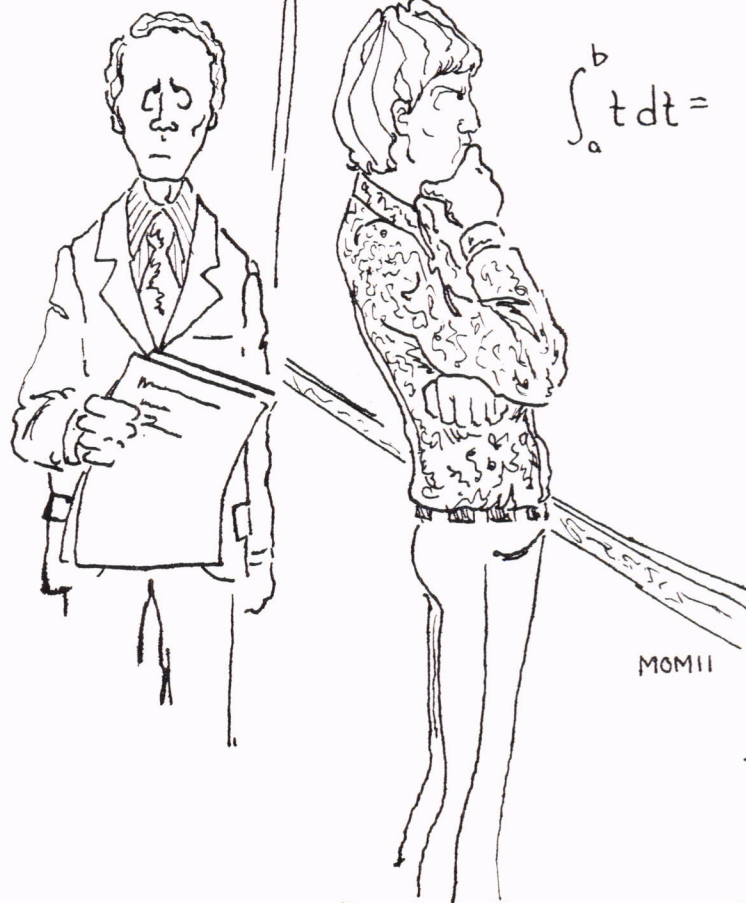
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THE ORIGINS OF THE ELECTRONIC DIGITAL COMPUTERS

by Greg C. Eichert

(BABBAGE'S DREAM WORLD)

Although today the computer systems are many and quite complex, they all were made possible by the few original electronic computers developed in the 1940's and early 1950's. Each one of these early electronic computers paved the way for today's computer systems.

The birth of the electronic computer age occurred in 1942 with the design of the first electronic computer, which was to overcome some of the limitations of mechanical calculating devices.

The last and ultimate mechanical calculating device was the Harvard MARK I developed between 1937 and 1944 by Professor Aiken of Harvard, along with B.M. Durfee, F.E. Hamilton, and C.D. Lake of IBM for the Harvard Computation Lab. The MARK I, sometimes referred to as the ASCC (Automatic Sequence Controlled Calculator), was used during World War I for the computation of ballistics tables. It was an electromechanical device, consisting of 51 panels, each 1 foot wide and 8 feet high.¹ This machine could add in 0.3 seconds to 23 significant figures.² The data and directions were fed to the MARK I by means of a paper tape, punched in coded form. The holes in this tape were read by sensing devices which caused the calculator to perform the operation called for by the tape.³ Because this input system was not fast enough for a machine in which the computations were to be done by electronic means, it was said that any similar device to the MARK I would never be built again.⁴

A calculating device which does computations by electronic means is a digital computer. The first electronic

computer was the ENIAC (Electronic Numerical Integrator and Computer). ENIAC was designed and built at the Moore School of Electrical Engineering of the University of Pennsylvania by Dr. John W. Mauchly and J. Preper Eckert between 1942 and 1946.⁵ ENIAC was developed for the U.S. Army for the chief purpose of solving ballistics problems at the Aberdeen Proving Grounds, but it was also used for the solution of partial differential equations and the calculation of the values of π and of e to 2,000 decimal places.⁶

There are five major sections to any electronic digital computer: the memory, the arithmetical unit, the input mechanism, the output mechanism, and the control unit which gives out electrical signals that control the action of the other units.

The memory of ENIAC used vacuum tubes called ring counters and could store up to 20 words. Information was programmed into ENIAC by wired connections, plugs, and switches. ENIAC did addition in 200 microseconds and multiplication in 2,800 microseconds. All operations of ENIAC were controlled by an internal pulse generator or "clock". These pulses travelled at the rate of 100,000 per second. Groups of these pulses were used to represent alphameric or numeric characters.⁷ These pulses were controlled by the 18,000 vacuum tubes in ENIAC which used 175 kilowatts of power, weighed 30 tons, and occupied 1800 sq. ft. of space in the Moore School basement.⁸ It has been said that ENIAC is probably the largest computing machine that will ever be built.⁹

¹B.V. Bowden, *Faster Than Thought* (London, 1955), p. 173.

²Ibid., p. 173.

³Maurice V. Wilkes, David J. Wheeler, and Stanley Gill, *The Preparation of Programs for an Electronic Digital Computer* (Cambridge, Mass., 1951), p. 2.

⁴Andrew D. Booth, *Automation and Computing* (London, 1958), p. 25.

⁵Eckert and Mauchly later designed the now famous UNIVAC

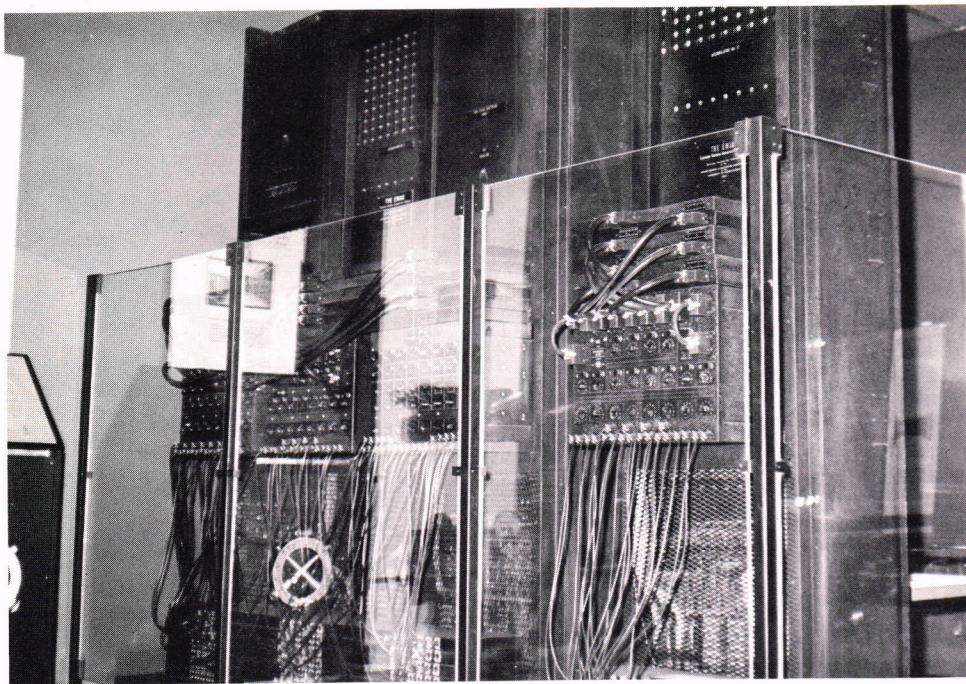
and formed the Remington Rand Corporation.

⁶ π is the unique infinite decimal which when multiplied by the diameter of a circle gives the circumference of the circle. e is the electrical charge of an electron.

⁷D.F. Parkhill, *The Challenge of the Computer Utility* (Reading, 1966), p. 14-15.

⁸Parkhill, p. 14-15.

⁹Bowden, p. 174



Hand programming
of the ENIAC
was a headache.

While ENIAC, the electronic digital computer, was a large crude device, it replaced electromechanical computers such as the MARK I by the use of vacuum tubes instead of mechanical relays for switching. This electronic switching enabled ENIAC to do calculations several hundred times faster than the MARK I and 1,000 times faster than any other calculating machine before it.¹⁰

Although ENIAC was a great advancement and operated at a speed never attained before, it was limited in its operations. One of the main limitations was the difficulty in presenting instructions to the machine. It took far too much time to prepare ENIAC to operate on consecutive programs. The input and output procedures were done on standard punched card equipment. Because it had a limited internal storage,¹¹ this equipment controlled and limited the speed at which ENIAC could compute, thus it could not reach the speed which was required for many problems of the mid-1940's. In all later digital computers, instructions were placed in coded form on punched cards, but these were then placed in a large quick-access store or memory in advance of the running of the program. This enabled the machines to take and execute each instruction in the store with the lightning speed of electricity.¹² By using the input cards to transfer the program into the memory, the computing actions of later computers were not controlled by the input cards directly as in ENIAC.¹³

Although ENIAC was limited, some tribute is due its designers and developers. A passage from the *Automatic Digital Calculators* comes close to the full tribute due ENIAC:

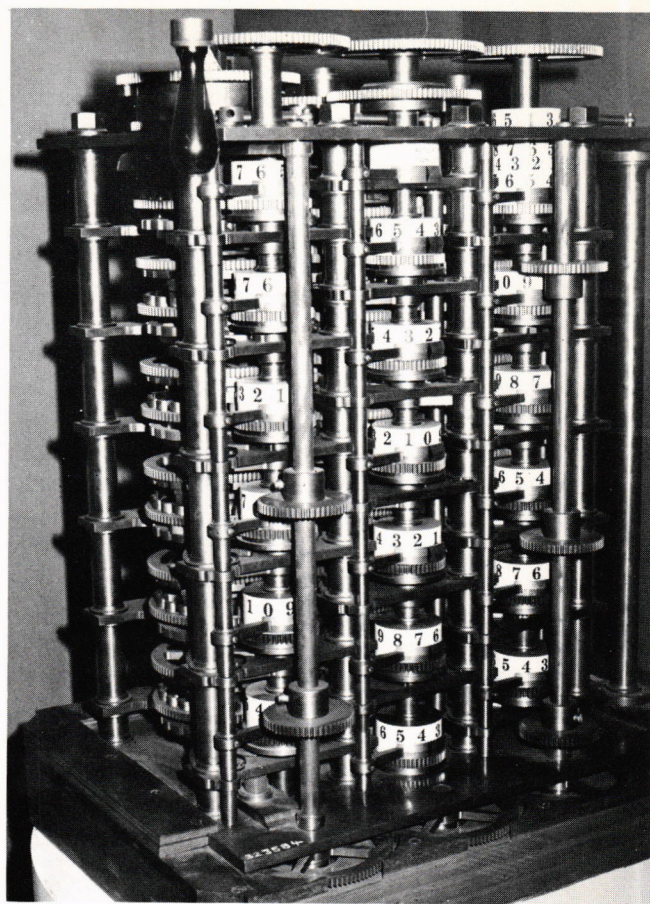
Despite its (ENIAC's) undoubted limitations and design complexity, ENIAC marks, perhaps, the most important single step in the history of applied mathematics, and it



provided the encouragement and backing for more versatile machines. . .¹⁴

By evaluating ENIAC, a design for a superior computer evolved. This computer was known as EDVAC (Electronic Discrete Variable Automatic Computer). EDVAC was designed for the U.S. Army in 1941 by the same team of researchers who worked on ENIAC at the Moore School. Despite engineering difficulties at the school, a publication of the final design for the computer was written by Dr. John von Neumann, one of the designers, and later published in June of 1945.¹⁵ Many future computers, designed along the lines of the von Neumann report, were far smaller and simpler than ENIAC, but quite a bit more powerful.¹⁶ The main reason for this greater power was that EDVAC had a more flexible control due to a new type of data storage unit which allowed a very fast computing rate. The programming difficulties of ENIAC were done away with in EDVAC (a stored program computer) by an electrically alterable that stored both instructions and data to be used in a calculation.¹⁷ This memory also held program orders for computing by expressing the orders in a numeric code.¹⁸

The basic unit of the storage memory of EDVAC was an ultrasonic delay unit which was a 5 foot steel cylinder closed at both ends by a quartz crystal and filled with mercury.¹⁹ Coded characters (numbers, letters, etc.) were fed to one of the quartz crystals by electronic pulses. Different combinations of groups of these pulses represented a single unique character code. One quartz crystal converted the electronic pulses into high frequency sound waves that traveled through the mercury in about one millisecond to the second crystal. This crystal then converted the sound waves back into electronic pulses, which were then sent back again to the first crystal. This procedure continued at a rate of 1,000 times per second until the data represented by the pulses was needed for an operation in the arithmetic or logic units of the computer.²⁰ The electronic pulses were about a microsecond long. As many as 500 pulses could travel at the same time in the cylinder. These 500 pulses could travel at the same time in the cylinder. These 500 pulses would represent 32 coded characters being stored in the cylinder at a time.²¹ In June of 1946, Dr. von Neumann published another report on electronic digital computers. This later report was written after a conference at the Institute of Advanced



Babbages Analytical Machine. It just wasn't fast enough.

Study at Princeton of several leading scientists in Applied Mathematics, Electrical Engineering and Physics. This famous report, known as the "Preliminary Discussion of the Logical Design of an Electronic Computing Instrument", reviewed in detail the entire field of computer design.²²

These two reports of Dr. von Neumann made possible the construction of the first operational internal stored program computer by the University of Cambridge in 1949. This computer, known as EDSAC (Electronic Delayed Storage Automatic Computer), was constructed under the direction of M.V. Wilkes of Cambridge.²³ The EDSAC computer was almost an exact duplicate of EDVAC except for a few certain modifications.

The ultrasonic memory of EDSAC was similar to EDVAC except for the capacity. EDSAC's memory was

ENIAC had 18,000 tubes. ENIAC used 175 kilowatts of power where EDVAC used only 15 kilowatts.

¹⁷Parkhill, p. 14-15.

¹⁸Arnold, Hill, and Nichols, p. 3.

¹⁹Mercury is the only elemental metal that is a liquid at standard room temperature and normal atmospheric pressure.

²⁰Parkhill, p. 132-133.

²¹Ibid., p. 132-133.

²²Parkhill, p. 14-15.

²³Andrew D. and Kathleen H.V. Booth, p. 16.

²⁴Ibid., p. 16.

¹⁰Arnold, Hill, and Nichols, p. 28-29.

¹¹A store, or memory, is needed in automatic computing machines for the purpose of holding data and information.

¹²The speed of electricity is the same as that of light which is 186,000 miles per second. Note: our space rockets travel at the speed of 7 miles per second.

¹³Maurice V. Wilkes, David Wheeler, and Stanley Gill, p. 2-3.

¹⁴Andrew D. Booth and Kathleen H.V. Booth, *Automatic Digital Calculators* (New York, 1956), p. 14-15.

¹⁵Parkhill, p. 14-15.

¹⁶One example of EDVAC's smallness and simplicity in respect to ENIAC is that EDVAC contained 4,000 vacuum tubes where

designed to have a capacity of 1024 numbers, each of five digit decimals expressed in a 17 binary digit code, or a capacity of 512 words each having 34 binary code digits.²⁴ A five-hole punch read by a photoelectric tape reader was used for the input to EDSAC, while a teleprinter was used for the output. All the data required for the solution of a problem was punched on a single input tape.

The memory of EDSAC allowed addition and subtraction time to be about 34 microseconds and multiplication time to be approximately 8.5 milliseconds.²⁵

After the completion of EDSAC, the computer industry began to expand in all directions at a very fast rate, but the computers to follow the three major original computers (ANIAS, EDVAC, EDSAC) used many of the principals of the original computer designs of ENIAC, EDSAC, and EDVAC. The development of ENIAC proved that the concept of high speed calculations by electrical means was possible. It out-dated mechanical calculators by having greater speed and accuracy. Because of the success of ENIAC, the scientific world began to experiment with ideas for computers with greater possibilities and more logical designs. The limitations of ENIAC stimulated the growth of

the computer world just as much as the success of ENIAC because of the questions raised in the minds of the designers of electronic calculators.

By answering these questions, EDVAC was designed. The EDVAC design in turn made possible the construction of EDSAC, and many other computers such as SEAC, ACE, UNIVAC, MANIAC, and WHIRLWIND.²⁶ The two reports written by von Neumann laid the foundations for the design of most of the best computers available up to 1953, and projected some of the principals of the construction of many of the computers developed and built up to 1956.²⁷

The overall effects of ENIAC, EDVAC, and EDSAC on today's computer systems are many, some still not fully definable, but a fitting quote to show the impact of the original electronic digital calculators is found in Booth's *Automation and Computing*.

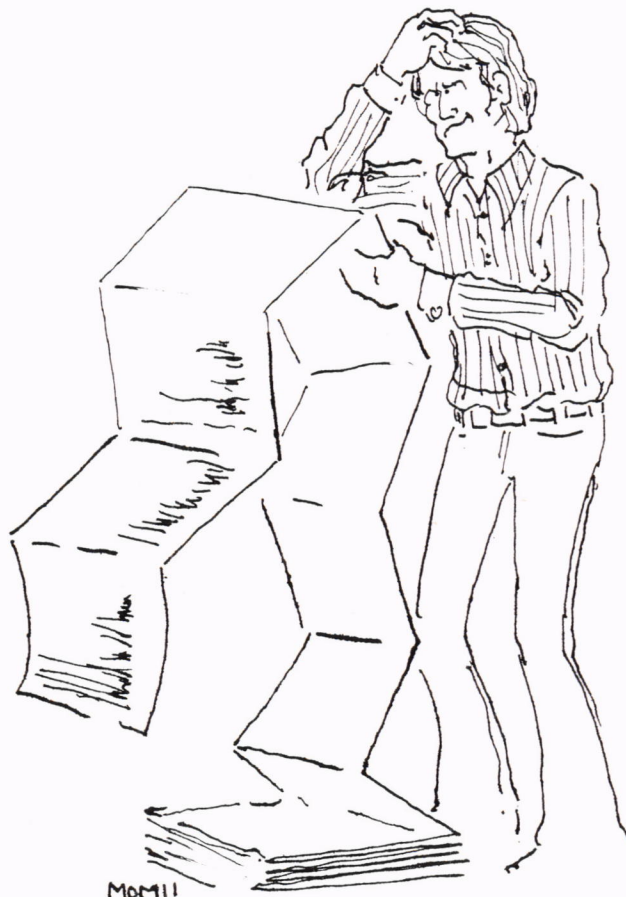
Thus it happens that the automatic digital calculator, from its original position as a tool of the pure mathematician and scientist, has made rapid strides in removing the army of clerks which beset enterprises of any scale in our modern world.²⁸

²⁵Ibid., p. 16.

²⁶Bowden, p. 175-178.

²⁷Andrew and Kathleen Booth, p. 17.

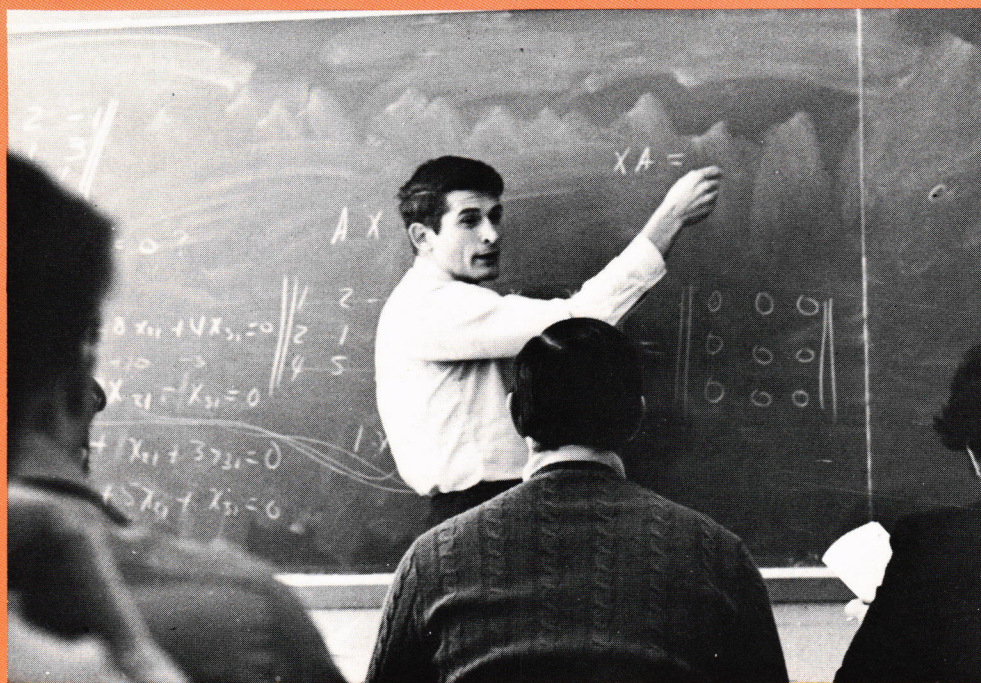
²⁸Ibid., p. 26.



FACULTY SPOTLIGHT:

DR. DOUGLAS JONES

by Robert Grant



Dr. Douglas Jones is one of the most active members of our faculty, and is held in high regard by the *Mecheleciv* staff and many of the students. For several years, Dr. Jones has maintained an active interest in areas concerning both the faculty and the students. He has recognized the need for better student-faculty communication and is doing something about it.

Dr. Jones has been the advisor to our magazine for several years, and this September became advisor to Theta Tau. With the student professional organizations, he has taken part in a tutoring program and a professional development program, and has even participated in intramural sports.

After receiving his B.M.E. and M.S.E. degrees from George Washington University, Dr. Jones began teaching here in 1966 while working towards his doctorate. As both an undergraduate and a graduate student, he received many honors and awards including membership in Sigma Tau,

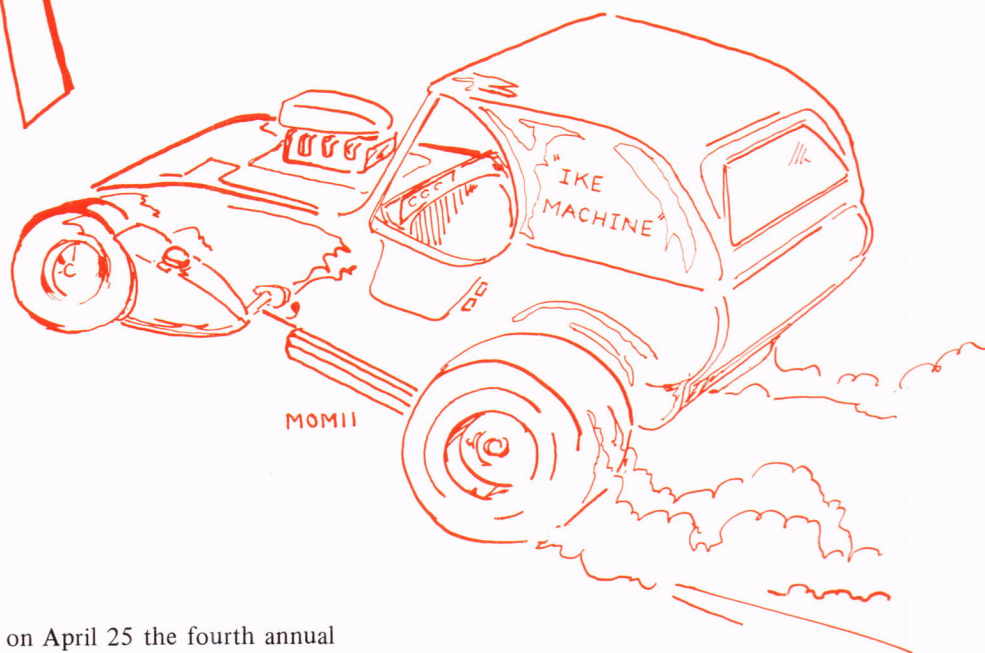
Tau Beta Pi, Omicron Delta Kappa, and Sigma Pi Sigma honor societies, and the Norman B. Ames Award as outstanding senior. While an undergraduate, he became a member of Theta Tau and was Editor of *Mecheleciv*.

In 1964, Dr. Jones became a member of the Board of Directors of the Engineering Alumni Association. He has held the office of Treasurer and this year was elected as President. He is also the Faculty Representative to the Governing Board of the General Alumni Association, and is Vice-President of the Board of Directors of the Wesley Foundation.

When asked about today's students, Dr. Jones said that they seem to be better prepared for a college education and "... more willing to criticize, which has its good and bad facets, but they should try to do so more objectively."

In spite of the decrease in Engineering enrollment across the country, Dr. Jones feels that SEAS is making progress toward becoming a better known school.

1971 OT RALLY



Beginning at 11:00 A.M. on April 25 the fourth annual Theta Tau Auto Rally will begin. Open to all students it will culminate with a picnic at Carderock State Park. To be eligible to enter you will need yourself, a friend, and a car, any car will do so long as it runs under its own power. There is no limit to the number of people entered with each car. The object of the rally is to drive your car through the course described in the instructions provided which are interpreted by your friend the navigator, and then complete the course in the time allotted in the instructions. It is not a race against either the clock or your opponents but an exercise in following instructions. Check points are spaced along the route to deduct penalty points from the cars based on how well they have followed the instructions. You will be burned for \$2.50 (if paid ahead of time — \$3.00 if you wait till the last minute), but there will be beer and hot dogs waiting at the end of the long haul.

Watch the bulletin boards in Tompkins Hall and posters on campus for further information.

ENTRY FORM



NAME _____

ADDRESS _____

PHONE _____ REQUESTED CAR NO. _____

PLEASE FILL IN AND BRING TO TOMP. 100
TO BE PLACED IN OT MAILBOX

THE MECHELECIV



Sharon Hines

**MECH*

MISS



Daguerreotypes by

Jeff Davis



A Secondary Education major in the field of English Literature, this month's attractive Mech Miss is Miss Sharon Hines. Originally from Muscatine, Iowa, Sharon has attended Iowa University, Stephens College in Columbia, Missouri, and has worked for the Playboy Club as Assistant to the International Bunny Director. A junior transfer to G.W., she plans to teach high school or community college in the D.C. area upon graduation. Her favorite activities include riding, skiing, and literature.

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Campus News

SEAS SELECTED TO PARTICIPATE IN MUSTANG POLLUTION ENGINEERING PROJECT

The School of Engineering and Applied Science has been selected by the Ford Motor Company as one of the twenty engineering schools in the country to participate in its Mustang Engineering Project.

The Mustang Project has been created to afford engineering faculty and students an opportunity to increase the effectiveness of learning experiences by having students work on "real life" problems as part of their engineering studies.

Dean Harold Liebowitz announced that Drs. C.M. Chen and J.S.W. Chi of the Department of Civil, Mechanical, and Environmental Engineering would head up the project.

Most approaches to solving the pollution problem for automobiles have been concerned with studying the after-burner. Drs. Chen and Chi will test a unique approach by studying the process in the injection system. With the help of their students, they plan to install an injection system of their own design on the engine of the Mustang automobile that will be made available to SEAS by the Ford Motor Company for an eight week period.

The proposed process will initiate ignition of the air-gasoline mixture by spraying into the combustion chamber an igniting fluid such as Glycol Ether. When ignited, particles of the igniting fluid will thoroughly penetrate the air-gasoline mixture causing uniform ignition. It is believed that the uniform ignition may enable complete combustion to be achieved, and the amount of pollutants formed and fuel consumed may be reduced.

After the project has been completed, a report will be written and submitted to the Ford Motor Company for evaluation. A national prize of \$1,000 will be awarded for the best project.

ENGINEERS' COUNCIL

ENGINEERS' COUNCIL ELECTIONS

In the second week of March the Engineers' Council held elections for the coming year. The following were elected:

President — Howard Kellman
Vice-president — Frank Atwood
Secretary — Danuta Danek
Senior Rep — Dave Sobel
Junior Rep — Ray Grant
Graduate Rep — Jorge Aunon

At the March 18th meeting President Kellman appointed the following to fill the vacancies:

Treasurer — Steve Miller
D-H House Manager — Albert Lee
Sophomore Rep — Steve Salamoff

SCHOLARSHIP COMMITTEE REPORT ON AWARDING ENGINEERS' COUNCIL SCHOLARSHIPS

The purpose of awarding these scholarships is to encourage and reward students who actively participate in and contribute to the school.

CRITERIA

1. The student must be in good standing with the university.
 - a. Conduct
 - b. Academic
 - c. Other

2. Financial need.
3. Student activities in the engineering school and in the university.
4. Scholastic achievement.
5. No awards will be made for the freshman year.

PROCEDURE

1. Scholarships will be awarded once a year in the spring for the following academic year starting in September.
2. The Scholarship Committee will draft a questionnaire for financial need, which will be a student's (not parent's) confidential statement. The committee will also draft a questionnaire for student activities and scholastic achievement.
3. The financial need of the applicants will be determined by the SEAS admissions office.
4. The contents of the financial statements will be known only by the SEAS admission office.
5. The admissions office will present the scholarship committee with a list of names in the order of need, accompanied with the amount of financial aid needed.
6. The scholarship committee will make the final recommendation to the Dean via the Engineers' Council on the recipients. The funds available to the scholarship committee will be split into graduate and undergraduate categories, half of the funds being put into each category. If in one year the funds in one category are not exhausted, the remaining money will be directed into the other category.
7. The award decisions will be based on the following relative weighting scale:

Student activities (in SEAS and the University)	50%
Financial need	30%
Scholastic achievement	20%

 Evaluation of the applicants' scores in the three areas listed above will be done for the undergraduate category completely separate from the graduate category.
8. Additional consideration will be given to students who received awards the previous year.
9. The scholarships will be transacted through the Office of Student Financial Aid, and scholarships will be for credit toward tuition, fees and books, and room and board.
It will be necessary that the scholarship committee be made a standing committee in order to administer the funds year after year.

38 STUDENTS MAKE SEAS HONORS LIST FOR FALL SEMESTER 1970

Dean Harold Liebowitz announced that at the close of the Fall Semester 1970, 22% of the total full time

undergraduate student body (38 students out of 176) achieved the Honors List. Almost 37% of the Honors list is composed of entering freshmen. By curriculum, 27% of the Honors freshmen are in Civil Engineering, 26% in Electrical Engineering and Computer Science, and 14% in Mechanical Engineering. Steven T. Momii, a senior in Electrical Engineering, was the only student to achieve a straight 4.0 average.



4.0 STEVE MOMII

An informal "coke and coffee" in honor of the Honors List students will be held in the Engineering Room, Tompkins Hall, Room 206, on April 13 at 3:00 PM.

Faiz A. Al-Khayyal
Gokalp Babaoglu
Herbert S. Bedwinek
Jerrold S. Bonn
Daniel P. Boyle
Keith A. Buckle
William G. Conover
Danuta L. Danek
Rose M. DeGiulio
Peter A. Edler
Hugh H. Faust
Herbert M. Federhen
David R. Forsyth
Imad S. Golmieh
Warren E. Haug
Raymond L. Holmes
Elmer D. Hoskin, Jr.
June E. Jones
William L. Konick

Christopher A. Kouts
John C. Lacy
Gary L. Larson
Chester B. Lund
William R. McAninch
Charles E. McCullough III
Steven T. Momii
David K. Moy
Arshad Nawaz
Steven B. Salamoff
Thomas B. Schalk
Michael C. Serafinas
David R. Sobel
David D. Treadway
Alan C. Waldron
Waylon W. Webbon
Chester K. Wong
Robert G. Wright
Corey Zimmerman

ACADEMIC DISHONESTY

Upon investigation, certain members of the Engineers' Council found out that there is no clear cut procedure concerning cases of *academic dishonesty*.

At the Council meeting of March eighteenth, the following proposal was accepted by the Council. We strongly urge that the faculty accept this proposal.

1. Any case of academic dishonesty should be reported immediately by the student(s) plaintiff to the academic committee of the Engineers' Council.
2. The student(s) reporting the incident would then be explained his legal rights and responsibilities involved in the procedure.
3. The plaintiff would then submit a written testimony to the academic committee which would then take the case to the advisor of the accused person(s).
4. The advisor would then meet with the instructor of the class involved, the chairman of the department of the accused person's major, and any other persons that the forementioned feel is necessary to accurately review the case.
5. If there is positive evidence against the accused student(s), there are two possible outcomes.
 - a) If it is the first offense, then the case is recorded confidentially in a department file.
 - b) If it is the second offense of the student, he shall receive the grade of F-AD, (Failure-Academic Dishonesty) on his permanent record. It will then be recommended to a Dean's Council that the student(s) receive a full suspension of one semester.

After re-consideration by some of the students of SEAS, the following modifications to the above proposal will be submitted at the next Engineers' Council meeting.

1. Any case of academic dishonesty should be reported immediately by the student(s) plaintiff to the academic committee of the Engineers' Council.
2. The student(s) reporting the incident would then be explained his legal rights and responsibilities involved in the procedure.
3. The plaintiff would then submit a written testimony to the academic committee who will show a copy of this statement to the accused student(s), who will be asked to submit a written statement (rebuttal) if he so choses. The accused student(s) will then be explained the procedure that will follow.
4. The academic committee will take both statements to the accused student(s)' advisor(s) who will then meet with the instructor of the class involved, the chairmen of the departments of the accused student(s), the plaintiff, and the accused. Any other persons that the forementioned feel are necessary to accurately review the case may also be called in.

5. If there is positive evidence of academic dishonesty by the accused student(s) the following punishment will occur due to existing University regulations. The student shall receive the grade of F-AD (Failure-Academic Dishonesty) on his permanent record and also may, upon the recommendation of the Dean's Council, be suspended from the University for a finite time.

The above modified proposal has been written to insure due process of the accused student(s) and to comply with the present university policy on academic dishonesty.

I.E.E.E. ANNUAL AWARDS

Michael A. Seijo and Jeffrey L. Jacox, seniors in electrical engineering, were both honored for their academic achievements and service to the School at the Eighth Annual Awards Banquet of the Institute of Electrical and Electronics Engineers, Washington and Baltimore Sections.

Mr. Seijo received the Institute Award and Mr. Jacox the Washington Section Award. Both students are planning to graduate in June 1971.

The banquet was held on March 2, 1971 at the University of Maryland's Center of Adult Education, with more than 500 people in attendance.

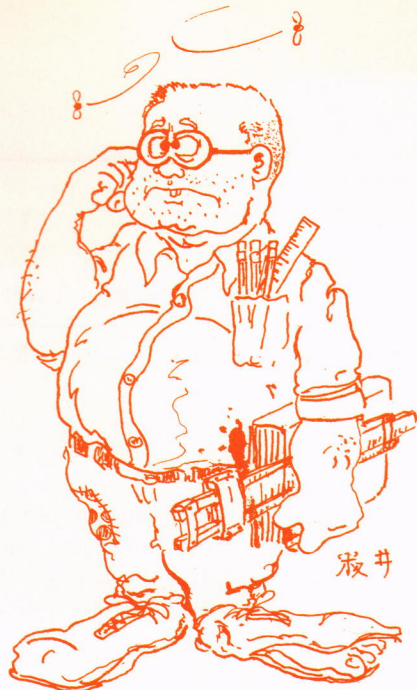
THETA TAU

Theta Tau initiated two new student members at the end of fall semester. They are sophomore Jeff Davis and freshman Al Davis. On February 6th, Dean Liebowitz became an Honorary Member of Theta Tau. Several alumni attended the Dean's initiation and joined the brothers afterward for lunch at the University Club.

Late in February, alumni Doug Jones, Ray Morales, and Herb Wilkinson took part in Theta Tau's professional development program. They spoke with the student members about the various aspects of Engineering related to their own occupations. Doug is a member of the SEAS faculty teaching undergraduates and graduates. Ray is a Consultant Engineer in Washington, and Herb is a Design Engineer working in the Washington area.

Theta Tau will again participate in the intramural sports program this semester, beginning with bowling and volleyball. Softball begins in late March, and wrestling and swimming will be in April. Theta Tau won the wrestling championship last year and hopes to do the same this year. We also plan to take part in tennis and track at the end of the semester.

Theta Tau will hold an Auto Rally this spring. Anyone who has a car is invited to join us for a really enjoyable day.



FACULTY NEWS

Dr. G.M. Arkilic, Acting Assistant Dean, has accepted an invitation to become a member of the Advisory Committee on Engineering (Transfer) Curriculum at the Community College of Baltimore.

The function of this committee is to provide the Community College of Baltimore the expertise required for curriculum structure and implementation and to act as a liaison with industry, the community, and higher education.

Dr. Arkilic has been very active in working with representatives of community colleges and technical institutes to establish and implement curricula and procedures to facilitate the transfer of students to SEAS without loss of time or academic credit.

Dr. Roger H. Lang, Department of Electrical Engineering and Computer Science was the featured speaker at the March meeting of the Washington Section of the Institute of Electrical and Electronics Engineers (IEEE) Group on Information Theory. Dr. Lang's talk was entitled: "Stochastic Differential Equations."

Dean Harold Liebowitz presented a graduate seminar on *Fracture of Materials and Structures* on March 16, 1971 at the New York University School of Engineering and Science, Daniel Guggenheim School of Aeronautics.

The Dean has also been invited to serve on an ad hoc Task Group on Biomaterials Research and Development by the Committee on the Interplay of Engineering with Biology and Medicine (CIEBM) of the National Academy of Engineering.

The Dean and Dr. A.M. Freudenthal have been invited to address a seminar concerned with deformation and fracture

in design. Dean Liebowitz will speak on *Fracture Mechanics in Design* and Dr. Freudenthal on *Fatigue Mechanisms and Fatigue Design*.

The seminar is co-sponsored by the Education Committee of the Washington, D.C. Chapter of the American Society for Metals and the National Bureau of Standards. The seminar will be presented on April 22, 1971 at the National Bureau of Standards in Gaithersburg, Maryland.

Dr. Joseph Yahalom, Visiting Associate Professor of Materials Science and Associate Professor of Materials Engineering, Technion-Israel Institute of Technology, conducted a seminar early this year at the Massachusetts Institute of Technology, Department of Materials Science and Metallurgy, on "The Electrolytic Breakdown of Anodic Films."

Dr. Warren P. Mason, Research Professor of Engineering, Department of Civil, Mechanical, and Environmental Engineering, has recently addressed the Solid Mechanics Group of the Johns Hopkins University. Dr. Mason's talk was on the "Fifty Years of Ferroelectricity."

Dr. Mason has been selected to receive the 1971 Gold Medal of the Acoustical Society of America for his accomplishments as a research scientist and teacher.

The award is scheduled for April 21, 1971 at the Spring meeting of the Society.

Dr. Mason has been conducting his research in acoustics at the School's Institute for the Study of Fatigue, Fracture, and Structural Reliability since 1969. He was formerly with the Bell Telephone Laboratories, Murray Hill, New Jersey, as Head of the Mechanics Branch.

In his long and distinguished scientific career starting in 1921 when he received his bachelor's degree in electrical engineering from the University of Kansas, Dr. Mason has published more than 20 books and 150 articles. He is a fellow of the Physical Society and IEEE, and an Honorary Fellow of the Audio Engineering Society.

Drs. Donald Gross and Carl M. Harris, Department of Engineering Administration and Operations Research have had the following papers published or accepted for publication:

Dr. Harris:

"On Queues with State-Dependent Erlang Service," Naval Research Logistics Quarterly, March 1971.

Drs. Gross and Harris:

"On One-for-One Ordering Inventory Policies with State-Dependent Lead Times," Operations Research, March-April 1971 "Stochastic Inventory Models with Bulk Demand and State-Dependent Lead Times," Journal of Applied Probability, September 1971. (Note: J.A. Lechner of the Research Analysis Corp. is also a co-author)

Dr. Harris also has been named an Associate Editor of *Operations Research*, the bi-monthly journal of the Operations Research Society of America. Dr. Harris will be responsible for papers in the areas of inventory, reliability, and queuing.

THE FUTURE OF ENGINEERS' WEEK

DECIDE NOW!

BY RICHARD TABOR

Engineers' Week at the School of Engineering and Applied Science has been a tradition since 1962. However, this tradition is slowly fading. Whatever the original concept of Engineers' Week was, its goals and purposes have become very unclear in the past year. Finding a single chairman this year was impossible — co-chairmen, only as a last resort. This only complicated the organizing and total responsibility problems. Exhibit space, student apathy, and student-faculty relationships were also important issues. A firm decision to continue or not to continue Engineers' Week and in what form should be made now after examining these relevant factors.

ENGINEERS' WEEK — IDEALS AND GOALS

From the inception of Engineers' Week, it seems that the exhibition has followed a course with no new plans or ideas. Every year, the chairman has opened the labs and arranged for exhibits from various government agencies and outside companies. It is very hard to break away from a tradition that has been successful, especially when the planning takes so much time. As a senior, the chairman must not only carry his regular heavy load with no compensation but also must decide upon his future. This very time-consuming task should make any intelligent student think twice before accepting such a demanding position.

This year, the whole question of the why and how of Engineers' Week has come to a peak. What are the goals of

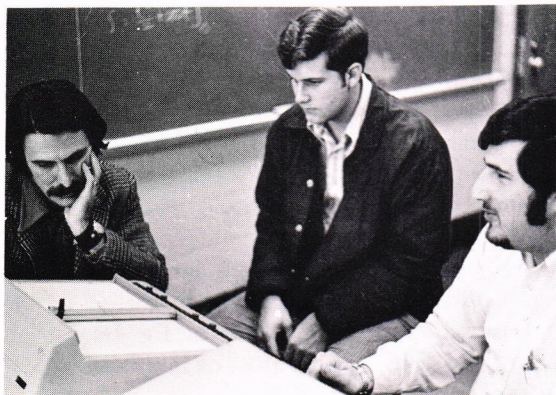
Engineers' Week? What are we trying to accomplish? Consensus seems to indicate that the main goal is to try to show what G.W. is doing for Engineering. If this is the case, why bring in outside exhibitors? This is a very important point since anybody can open a magazine, go to a technical science exhibit, or even the Smithsonian to learn the same things that they have been learning at Engineers' Week. What should be explained to the general public is what the University is doing on both the teaching and research levels to improve today's society — that what G.W. is doing is a very worthwhile and realizable goal.

ENGINEERS' WEEK — 1971

Realizing this trend after much planning had been done, the chairmen decided that even along this old route there would be changes. An attempt would be made to involve more students in planning so that the whole exhibit would fit together in a more cohesive manner.

Engineers' Week last year was a massive operation to jam in as many exhibits as possible. This was very impressive, but not as effective as it might have been. This year, a different pattern was tried with fewer exhibitors. In each group of exhibits, a general story was created with a beginning, explaining the problem or cause, the middle, explaining what was being done, and the end, showing the final results. This type of general explanation seemed to give the public a feeling of what engineering is doing for them. The theme of Engineers' Week this year was, "Engineering . . . To Improve the Quality of Life". Grouping similar exhibits together seemed to help in expressing different areas included in the theme.

There were three main rooms of exhibits. The first room was on the flight to the moon, not just some fancy instruments on space flight or a capsule, but these combined with a poster display on Moon Rock Research which was very informative and interesting. In the second room was an exhibit on pollution problems today and what is being done to correct this overwhelming problem. To complement this exhibit, there was also a half-hour film on Ecology which told an excellent story of how pollution happened and what has to be done. The third room contained several different exhibits explaining new technol-



ogy today and how it is helping to improve the quality of life. These included a desalinization process, a medical engineering terminal from the G.W. hospital, and a weather satellite display. All these exhibits were relevant towards the theme and all the exhibits were separated into groups in different rooms so that an individual story using each set of exhibits could be told.

As usual, the labs were open to the public and were very impressive in that they showed what students are learning



and how certain equipment could possibly be used in improving the quality of life through research and technology.

Engineers' Week could have been further developed by showing the results of SEAS faculty research. Many of our faculty are famous in their fields and not a single exhibit pointed this out. An informal lounge was planned for this type of display using books and publications by faculty and showing research being done, particularly the Fatigue Institute through closed circuit TV. However, this never was successful. It was an "experiment" in the sense that the mold of Engineers' Week was tried to be changed but failed. However, it was planned for up until the morning of the exhibition when the chairmen were informed that the faculty material would be impossible to set up. This kind of situation helped to make the exhibition look "skempy". A room that would have been used to show what G.W. is doing was left almost vacant and useless because of a lack of communication.

MARCH 1971

ENGINEERS' WEEK – THE FUTURE

After the exhibition, Dean Liebowitz formed a committee of students, alumni, and faculty to consider the future of Engineers' Week. This committee will discuss the goals and ideals of Engineers' Week and form recommendations concerning types of exhibits, dates, and goals. Problems in past exhibitions will also be discussed. Many of these problems fall into the area of student-faculty relationships and student apathy. Student apathy is a very important point since Engineers' Week is supposed to be a student run – student organized operation.

This committee is important in maintaining ties between the students and the administration. However, the *ultimate decision* to continue or not to continue Engineers' Week should fall upon the students since they are responsible for the success of the exhibition. This indicates that all students should voice their opinions to members of this committee. There is nothing more unfortunate than a project that does not have the full support and dedication of those involved.



Committee Members: D. Jones, Chairman; M. Eisenberg; G. Schueller; W. Holt; G. Ellowitz; F. Hooper; R. Tabor; M. Seijo; H. Kellman; D. Wallroth, S. Manion

the Mecheleciv



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NO. 2



Engineers' Council Meeting

**SCHOOL OF ENGINEERING
THE GEORGE WASHINGTON UNIVERSITY**
EIGHTEEN YEARS OF QUESTIONABLE PROGRESS



By the 'Fearless Forecaster'



I have been asked to say a few words about the old Engineers' Council. Well, judging from the Council's performance one doesn't have many positive things to say about it.

The problem with the Council was that it lacked leadership. It is as simple as that. One has to wonder if the president was on the council to help the school or merely to list on his résumé that he was president of the Engineers' Council. One has to wonder about all the issues that should have been acted upon by the Council, that weren't.

But, in all fairness, three members of the Council did a fine job: Jeff Jacox, Lou Mogavero, and Jerry Bonn. The rest of the council, also, was not without its accomplishments. Specifically, it did three things. Number one: it caused more students to become more apathetic than ever before. Number two: it proved that it could form more committees than the U.S. Congress. Number three: it showed that the committee system does not work.

Last month a new Engineers' Council took over. This council appears to be a better one than last year's, and hopefully will be an improvement over last year's council. Judging from last year's performance, this will not be a hard task for the new council.

* * *

A quote "Committees are the Number One way to destroy an idea." R.G.

TO ALL M.E.'S The space below is for a free body diagram. Draw the free body diagram of a satellite orbiting

around the earth. The first one to send "Fearless" the right answer will get a five dollar reward. Send to "Fearless Forecaster" Mecheleciv Magazine, 800 21st St., Washington, D.C.

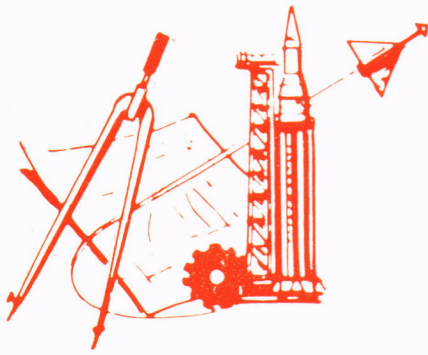
The correct answer will appear in the next issue.

* * *

The resolution allowing a student to be present at faculty meetings is still in some faculty committee. It has been eighteen months since the students first asked to have a student representative present at these meetings. What really goes on at those meetings???

* * *

A dedication: for all my beautiful words in this article — that is, all sentences of fifty words or more, all spelling and grammar errors, I thank my English composition teacher here at G.W. For he has taught me the fine art of writing English good.



TECH NEWS

THE B 5700

The B 5700 features a dual processor system of advanced architectural design and provides extended capabilities for data base management and data communications.

The B 5700 offers automatic multiprocessing, programming in compiler languages exclusively, expandability without reprogramming, re-entrant code, virtual memory, automatic allocation of system resources and fail soft capability, and the new data communications subsystem.

The B 5700 central system includes one or two 1 mHz central processors, up to 262,144 characters of 4 microsecond memory, up to four input/output multiplexing channels, a central control, console and supervisory printer.

System options include the new data communications processor, one or two auxiliary core memory subsystems with a speed of 1.2 microseconds, and a shared disk file feature.

System control permits all input/output operations to take place independently of each other and allows simultaneous read/write/compute operations.

Memory exchange permits instantaneous connection between any memory module and any processor or input/output channel. Input/output exchange permits instantaneous connection between any input/output channel and any input/output unit.

The primary use of the auxiliary memory is to provide a fast facility for data and program overlay. Access time to auxiliary memory is virtually zero.

The auxiliary memory subsystem has a capacity of up to 65,536 words per system and is expected to provide the user with a significant increase in system throughput.

With the B 5700 is a shared disk system which will allow up to four B 5700 systems to share the same disk file memory systems simultaneously. The combined, shared

disk computer network allows parallel, independent systems to effectively share not only a common data base in random disk files, but also different workload requirements such as batch and time sharing operations. With the shared disk system, there is no need for maintaining duplicate disk files or for restricting programmers to a particular system. Control decks entered on one computer can be executed on another, and printer back-ups may be printed on any system.

Disk file memory systems available with the B 5700 include 20 and/or 40 millisecond subsystems with a total capacity of up to 1.8 billion characters.



The medium-scale B 5700 in Burroughs Corporation's new 700 Systems.

LOWEST-COST SYSTEM/370, NEW TERMINAL AND CARD UNITS ANNOUNCED BY IBM

System/370 model 135, the newest and lowest-cost in the series, offers expanded communications capabilities as well as significantly improved performance to users of medium-size and smaller IBM computers — but without a comparable increase in cost.

Computer users moving into advanced data base and tele-processing applications will find the Model 135's combination of large data capacity, high performance and low-cost communications features ideal for their needs. A bank with branches or a manufacturing firm that has remote plants, for example, can expand to a management information network with the Model 135 more economically than ever before.

A data base is a central file of current, interrelated information available in seconds to many areas of an organization — even those miles away — through terminals linked to the computer.

Typical data base applications include instant updating of customer accounts from remote sales offices and graphic display inventory data at an executive's desk.

Also announced were a typewriter-like terminal and two new punched card units. The new terminal can be programmed to guide an operator in the preparation of invoices and other business documents while simultaneously storing data from the documents for high-speed transmission to a central System/370 or System/360 after working hours.

Called the IBM 3735 programmable buffered terminal, it can perform basic logic and arithmetic functions and store up to 146,400 characters of information on a high-density magnetic disk, or "buffer."

The new 3505 card reader and 3525 card punch provide more versatile processing of 80-column punched cards for users of System/370. The reader — the fastest IBM has ever offered — has an optical mark reading option, and the punch can be equipped with an optional print feature. These features enable the units to process documents — such as utility bills, shop control cards and license renewals — that usually require separate machines devoted to printing and optical mark reading.

System/370 Model 135 offers low-cost entry into tele-processing applications. Up to eight communications lines can be connected directly to the central processor, eliminating the conventional need for a separate data adapter unit. This capability is made possible by an optional integrated communications attachment. Many remote terminals and processors can be attached to each communications line.

Another optional feature, the integrated file adapter, permits direct attachment of the three-disk IBM 2319 direct-access storage.

The model 135 is up to four and one-half times faster

internally than the widely used System/360 Model 30 and up to six and one-half times faster than the Model 25 for typical commercial applications. It is even faster for typical scientific jobs.

Main memory sizes for the Model 135 range from 96,000 to 240,000 characters of data, a maximum nearly four times greater than that of the model 30.

The Model 135's memory is made entirely of monolithic circuits. Monolithic circuitry results in a faster and more compact memory than is possible with magnetic cores used in conventional computer memories.

An additional 24,000 characters of monolithic memory is provided for the Model 135's reloadable control storage (RCS), which holds all the instructions required for system control functions and selected optional features. These instructions are read into RCS from a disk cartridge supplied by IBM.

Most users of System/360 will not need to reprogram their existing applications to move up to the Model 135. In addition, the Model 135 permits users to run their Disk Operating System programs under control of the more powerful Operating System.



Engineers at IBM's laboratory in Hursley Park, England, analyze operations of a development model of the IBM System/370 Model 135.

BURROUGHS L 5000 MAGNETIC RECORD COMPUTER

The new Burroughs Corporation micrologic L 5000 magnetic record computer enables the user to read, store and retrieve a significantly increased amount of data on magnetic memory records and to produce a wide variety of accounting records and comprehensive management reports.

Data on magnetic memory records is provided in both printed and electronic form.

Printed data gives visual access to valuable current and historical information such as the status of a customer account and inventory records.

Through automatic selective electronic reading of the broad statistical data provided by the memory records, more timely and detailed reports can be produced. Variable addressing of the 352 digits of information stored on the magnetic records permits selection of categories of data for specific reports.

Users can refer to the magnetic memory records visually, use them as input to the computer for updating accounting records, and process them through an automatic magnetic record reader for many types of reports useful for effective management control.

Data stored electronically on the magnetic memory records contributes directly to speed, accuracy and processing productivity. The inventory memory record automatically provides product description, pricing, discount and other data for automatic completion of the invoice. The customer and inventory memory records are updated automatically.

Standard report writing programs are supplied with the L 5000 to display the data retrieved from the memory record in a meaningful format to suit the user's needs.

Forty-eight standard applicational programs, written in COBOL, are available now for such lines of business as manufacturing, contracting, credit union, hospitals, automobile dealers, banks and government.

The Burroughs automatic magnetic record reader enables automatic retrieval of data stored on the magnetic memory records and is an important adjunct to the L 5000. The reader performs many time consuming jobs automatically with electronic accuracy, complementing the L 5000 by handling the following:

- Input of variable data such as wage accrual information.
- Input of complete programs or program overlays.
- Automatic trial balancing.
- Automated preparation of management and statistical reports.

The L 5000 magnetic record computer operates with a variety of input and output peripheral devices which

increase accounting and management reporting flexibility. Readers for input of information include a punched paper tape reader, an edge punched card reader, and an 80-column punched card reader. Devices for output of information include a punched paper tape punch, an edge punched card punch, and an 80-column card punch.

A 26-inch forms handler, which has a 255-position print line, provides generous space for the simultaneous handling of a variety of forms and records on the L 5000.

The L 5000 is programmed internally. These computers utilize COBOL, the business programming language of large scale data processing systems.

The L 5000 has monolithic integrated circuitry, magnetic disk memory, advanced logic for powerful decision making ability, and fourth generation techniques called micrologic.

L 5000 micrologic, which consists of strings of micro-instructions stored in the computer's disk memory, provides complete internal control of computation, print formatting, printer positioning, forms movement, and console and peripheral data input and output.



Burroughs Corporation's L 5000 Magnetic Record Computer is the newest member of the Company's growing family of commercial mini-computers that use micrologic.

WESTINGHOUSE 2500 COMPUTER

Westinghouse 2500 computer is the first of a new line of small computers with the speed of data-processing machines as well as the reliability and capability needed for process control. A general-purpose machine for industrial, communications, and scientific applications, it has a 16-bit word

THE MECHELECIV

length and memory speed of 850 nanoseconds. Modularity permits both hardware and software expansion in the field. Hardware multiply and divide plus double-precision add and subtract are standard features. Options include memory protection, up to 65,536 words of core memory, floating-point hardware, and a choice of several mass memories. The unit is available in table or rack-mounted models and has a full line of peripheral equipment. Its instruction repertoire has more than 500 basic machine operations derived from a set of 44 instruction codes. Software packages include several versions of real-time monitors, assemblers, FORTRAN IV compilers, linking loaders and peripheral handlers. Also included are applications software, a simulator/assembler, a library of subroutines and debugging and utility packages.

DIETZGEN OFFERS UNIQUE NEW ELECTRONIC CALCULATOR

A compact, lightweight electronic calculator that simplifies virtually all commonly encountered engineering problems, has been announced by the Eugene Dietzgen Company, a leading maker of engineering graphics and surveying equipment and supplies.

The new calculator, weighing only 12 pounds, is about the size of an office typewriter. The calculator employs Large Scale Integrated circuitry throughout. By means of a simple key depression, the calculator provides logarithms, trigonometric functions, square root, raises any number to any power, factorials and other complex algebraic calculations in milliseconds. Reference tables for logs and trigonometric functions are unnecessary.

Keyboard entered data or data recalled from its six memory registers and problem solutions are displayed in a large size illuminated Nixie tube display area. Ten significant digits with sign and decimal point and also a two-digit exponent with sign are shown. Six data storage registers eliminate the necessity to jot down preliminary answers required later in a complex calculation.

The new Dietzgen calculator performs a virtually limitless variety of mathematical functions by means of single key depressions. In its Large Scale Integrated circuitry as many as 2,000 transistors function on a single 1/4" chip. This totally new calculator contains the equivalent of 55,000 transistors.

The unit operates on 115 volt A.C. current, drawing only 20 watts of power. The unit is capable of being upgraded with additional circuitry to increase memory storage registers to 10 and to add a programming capability of up to 128 steps.

NEW DATA COLLECTION AND INQUIRY TERMINALS

Burroughs Corporation has announced the first of a new
MARCH 1971



family of electronic terminal units that includes a series of data collection and inquiry terminals and a series of terminal controllers.

The new data collection and inquiry terminals are designated the TU 100 Series, and the terminal controllers are designated the TU 900 Series. These new units permit great flexibility and versatility in the design of extensive, low-cost data collection systems by linking remotely located and in-house sites to a central computer. Typical applications include plants, warehouses, hospitals, financial and educational institutions, and departments or offices within a building.

The operational flexibility and simplicity of the new units permits creation of a broad range of business systems and networks. This versatility, in conjunction with the proven applicational software of Burroughs central computers, provides excellent responsiveness to the needs of many of today's business concerns.

For example, payroll, inventory or production data in a manufacturing plant may be entered through a TU 100 keyboard, punched card reader and/or badge reader and be transmitted to the company's central computer for real time processing. As a result, new inventory positions or production schedule changes can be transmitted back from the central computer and printed at the remote site by the TU 100.

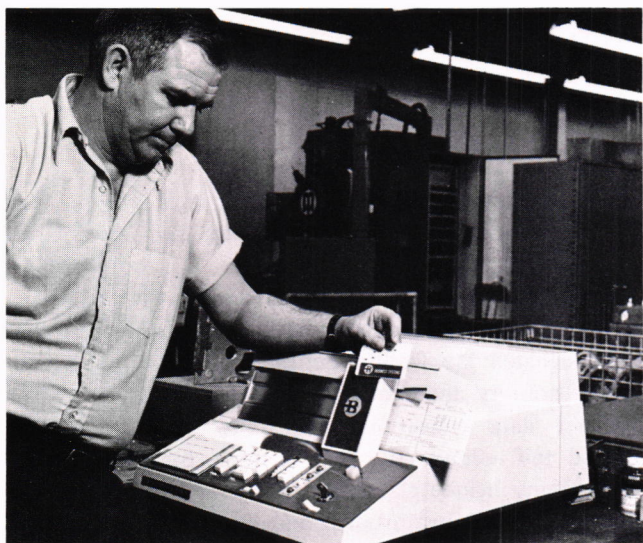
Collection of patient data with a TU 100 in a hospital or clinic is another application that is ideally suited to the low-cost terminal, further enhancing the Burroughs hospital systems already in use.

The TU 100 Series has a ten-key numeric keyboard, a 48-character alpha-numeric printer, four function keys and terminal status indicator lights. The printer operates at a

speed of 15 characters per second and prints on either a continuous paper strip or individual unit documents inserted in its optional validation chute.

Models of the TU 100 are available with a punched card reader capable of reading standard 20-80 column punched cards, 22-column plastic badges and 15-column plastic credit cards at a speed of 15 characters per second.

The TU 100 is designed to operate at 150 bits per second over dialed telephone network facilities, leased private lines, directly connected to an in-house data processing system, or in conjunction with the TU 920 Series of terminal controllers. The TU 920 terminal controller can collect data from up to 20 TU 100's, thus reducing lines costs. The controller further relieves the central computer of the time-consuming jobs of editing and operation sequence checking.



Burroughs TU 100 data collection and inquiry terminals are ideally suited for use in manufacturing plants as part of an extensive, low cost data collection system involving communication with terminal controller, Burroughs TC 500 terminal computers or central computers.

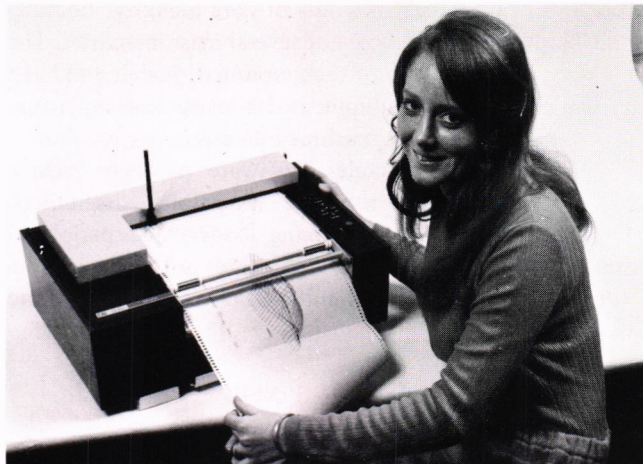
EAI INTRODUCES NEW PLOTTER FOR TIME-SHARE USERS

Electronic Associates, Incorporated announced the latest addition to its graphics line — the Model 230 — an incremental plotter, specifically designed for time-share users.

The 230 is a completely self-contained, desktop unit, compatibly interfaced to keyboard terminals and acoustic couplers. It includes easy-to-use, compatible FORTRAN plotting subroutines and provides, in one package, an immediate and efficient plotting capability for time-share users. Hardware and software operate at 110 and 300 baud.

A unique logic and data compression technique allows the plotter to operate at maximum speed in all directions,

including curved plots. The 230 plots graphics an average of five times faster than other comparably-priced units — hence minimum computer and telephone connect time charged, resulting in greatly reduced operating cost.



New EAI 230 DATAPLOTTER®

FIRST ALL-COMPUTER CONTOURING N/C OPERATING SUCCESSFULLY

Successful operation of industry's first all-stored-logic numerical contouring control in an actual application configuration was achieved early last month at the Bullard Company, Bridgeport, Conn.

This computerized unit is a Westinghouse New World C20 numerical contouring control. Fifteen more of the units currently are scheduled for shipment by the end of the first quarter of 1971 to nine other machine tool builders. Prices of the units range from about \$27,000 to \$55,000, depending on application requirements.



THE MECHELECIV

The vice president of engineering for Bullard, identified the tool controlled by the C20 unit as a Dyn-Au-Tape 86-inch vertical turret lathe. The machine is slated for use in the manufacture of turbine components at the new Winston-Salem, N.C., plant of the Westinghouse Steam Turbine Division.

The C20 contouring control was introduced last summer as industry's first all-stored-logic numerical control. It incorporates a Westinghouse Prodac 2000 minicomputer. A prototype unit successfully controlled a 28-inch Bullard Aku-tape vertical chucking machine at the Production Engineering Show in September, 1970, cutting a NASA test part.

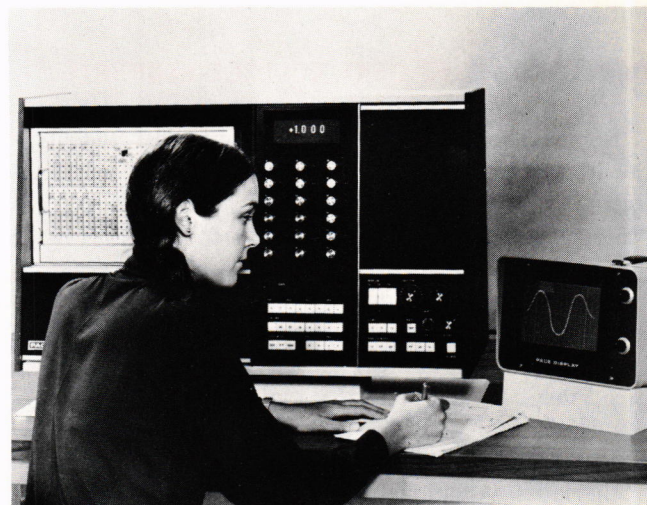
EAI INTRODUCES NEW EDUCATIONAL ANALOG/HYBRID COMPUTER

The EAI MiniACT™ — a ten-volt, analog/hybrid computer, specifically designed for the educational user — for the teacher who wishes to introduce the impact of real-life experience into the classroom in a vivid, graphic way — yet does not need to be a computer expert or electronic engineer to program the computer and demonstrate it.

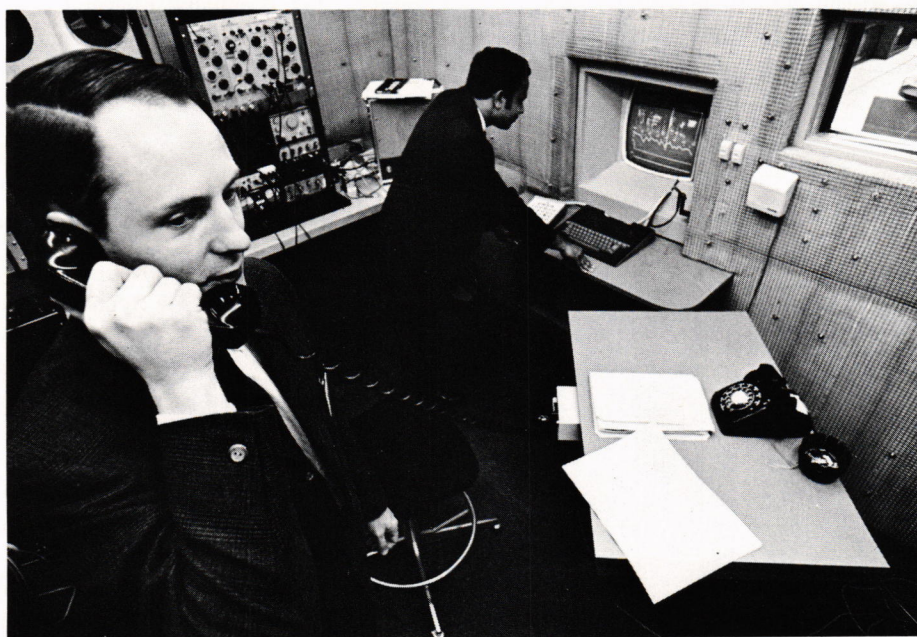
MiniAC design emphasizes simplicity of operation and superior performance for a low cost — “big system” features on a desktop computer. The new design includes pushbutton programming on summers, integrators, multi-

pliers-dividers, track/store, and function generators — easy to program — simple to operate. Push a button, and a summer becomes an integrator — or a multiplier becomes a divider.

Other outstanding features include modular expansion up to 27 amplifiers, standard digital voltmeter, optional logic expansion, electronic mode control, dual variable monitoring, and new simplified function generators.



EAI MiniACT™ ANALOG/HYBRID COMPUTER



In a sound-proof room at IBM's Raleigh, North Carolina, laboratory, engineers who took part in the development of an experimental voice recognition system demonstrate how it works. As Dr. William S. Mohn (left) speaks into a telephone, Dr. S.M. Das watches the patterns of his speech on an IBM 2250 display screen. The display unit is attached to a System/360, Model 40 in an adjoining room. The two goals of this program are to translate what is being said into machine-readable form and to verify who is speaking.

VOICE RECOGNITION

The prospects of extending the use of computer power to more people through the use of speech are generating a significant amount of development effort in university, industry and government laboratories.

Voice recognition and speech processing experimentation is currently underway at the IBM Systems Development Division laboratory, Research Triangle Park (Raleigh), North Carolina.

COMPUTER HELPS DEAF COLLEGE STUDENTS

Computer-assisted instruction is helping deaf students at the Rochester Institute of Technology prepare for college-level technical studies. The course, sponsored by the National Technical Institute for the Deaf, is also providing useful data on computer teaching methods for the deaf.

A major benefit of the technique is that each student interacts with the visual instructional material on an individual basis. While the student progresses at his own pace, the computer, an IBM 1500 instruction system, compiles data on his performance for future analysis.

More than 50 students have completed a course in mathematics. Additional courses in thermodynamics, biochemistry, and electronic circuit analysis are under development.

Ron Gelden, an industrial engineering freshman, estimated that he learned as much in three months with the computer as he did in six months with standard teaching

methods.

"I wouldn't have advanced to calculus this year without it. It has helped all aspects of my math study. I like it because there is not the pressure of a classroom situation."

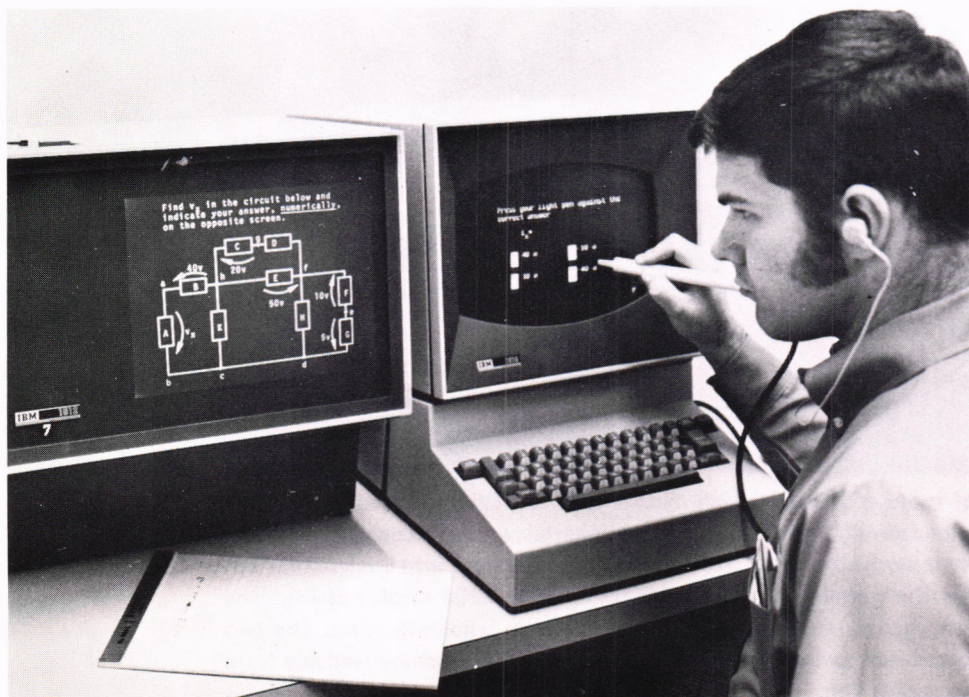
The students work at ten terminals linked to the IBM computer, which has been programmed with course material in mathematics.

Lesson material and test questions are flashed on the screens and the student responds by typing on the keyboard or touching parts of the image on the screen with the light pen.

If a student has difficulty with a particular concept — simplifying fractions, for example — the computer presents progressively simpler problems. Through his responses, the computer analyzes the student's strengths and weaknesses. If special help is indicated, a message is typed on a terminal near the central computer and a teacher responds with individual assistance. The computer may also refer the student to text books or work sheets for special help.

The program is designed to determine a student's educational abilities and deficiencies and — to a certain extent — to supply remedies in conjunction with the teacher. The computer's remedial role is expected to be enlarged as more data is gathered.

Dr. Barnes, director of Computer-Assisted Instruction, believes the method is a potentially powerful teaching device, although it is too early to draw definite conclusions. He noted that the mathematics course, originally aimed at deaf students, is equally applicable to students with normal hearing.



Michael H. Boyd of Omaha, Nebraska, first year student at Rochester Institute of Technology, uses a terminal linked to an IBM 1500 instruction system to study electronic circuit analysis. The course is one of several sponsored by the National Technical Institute for the Deaf to help deaf students prepare for college-level technical studies. The program is also providing researchers with valuable data on computer teaching methods for the deaf. Mr. Boyd is using a "light pen" to indicate his answer to a problem to the computer.

COMPUTER PROGRAMMING IN CONSTRUCTION

Computer Sciences Corporation has introduced a comprehensive package of applications programs for the construction industry through its nationwide time-sharing service, INFONET.

Collectively, these programs represent the most complete set of time-sharing tools available to the industry. The applications span the entire building process, from the initial phase of economic planning, through architectural design, engineering and field construction, he noted.

Fifty key programs in the series are available now. An additional dozen are scheduled for early 1971, with more to come later in the year.

Computer Sciences provides INFONET service from facilities in 15 cities across the country, with each facility serving customers in a number of surrounding states. Subscribers to the service communicate with the nearest INFONET facility via telephone circuits from remote terminal devices installed in their own offices.

Dr. Stanley Kaplan, INFONET's product manager for the construction industry, pointed out that the new offering provides two major benefits to architects, land developers, engineers, building contractors and others engaged in the industry.

First, INFONET's broad coverage of the construction industry provides a company with a single source for all of its applications requirements. This holds true both in terms of the variety of programs available and in the ease with which a company can obtain quick technical assistance in solving a difficult engineering or systems problem.

Equally important, many companies will be able to expand the scope of services they offer their own clients. A consulting engineering firm, for example, can now perform specialized soils and hydraulics studies which it might otherwise have contracted out to another company.

Programs in the construction package have been developed by leading companies in the fields of architecture and engineering, and have been thoroughly proven in use.

Included in the package are more than two dozen civil engineering, structural engineering, economic and planning applications developed by Daniel, Mann, Johnson and Mendenhall. DMJM is one of the world's largest firms of architects, engineers and planners.

Design Systems, Inc., of Boston has contributed its Architectural Interactive Design System (AIDS). With AIDS, the architect can use the distant computer to produce three-dimensional drawings to scale in his own office, and to provide many other types of assistance in the design function.

One of the largest engineering firms in Canada, Swan Wooster Engineering Co. Ltd., is represented by a set of programs that perform three-dimensional structural analysis in both static and dynamic modes. The programs accommodate up to 6,000 degrees of freedom in the static mode.

Cost estimating is made easy by Condex, a set of applications from the National Index of Construction Standards, New York. These programs contain data on the prevailing rates for labor and materials nationwide. They enable architects, engineers and even lending institutions to verify cost estimates and control construction costs at the various stages of the design process.

Major categories of applications in the engineering field include bridges, buildings, general structures, concrete and steel components, structural dynamics, surveying and highways, and hydraulics and sanitation.

A further benefit to companies using CSC's time-sharing system is its "full-service" characteristics, which provide three major types of remote computing on a single system.

The three services are: interactive time-sharing, used primarily to solve problems and develop computer programs for new applications; remote job entry, for rapidly processing conventional computer programs; and conversational remote job entry, a service which combines the features of the other two and thereby provides the user with greatly expanded data processing capabilities.

Company facilities offering INFONET service are in Boston, Chicago, Cleveland, Dallas, Detroit, Los Angeles, New York, Philadelphia, San Diego, San Francisco, Seattle, and in Portland, Ore., Richland, Wash., Richmond, Va., and Washington, D.C.

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OTHER LETTERS TO THE EDITOR

As I sit and think about my goals and aims for my new council, the first thing that comes to my mind is student participation. In order for the council to be an effective and meaningful body, new ideas and inputs must come from the student body as well as the council members. The class representatives were elected to serve as spokesmen for their groups. But unless each class representative meets with his classmates, he will not be performing his duties of office. The society and fraternity reps must also follow these guidelines. Even the executive officers of the council (including myself), must attempt to sense the feelings and ideas of the student body and try to keep their feelings in mind.

Let me say that I plan to continue many of the committees established under Donald Wallroth's leadership. The Academic Committee will continue to attempt to serve the academic needs and problems of the student body. David Sobel will chair this committee, and with the aid of the society reps, and the student body in general, evaluate complaints and attempt to bring about a realistic solution. The Recruitment Committee will continue to aid our Director of Admissions, Mr. Mannion, in striving to attract top students to our school. Student aid in contacting their former high schools and perspective students from their home town is needed. Finally, the Scholarship Committee will continue to function along the guidelines established by this year's committee.

The two issues of most urgency are Freshman Orientation and next year's Engineers' Week. Steve Miller will chair the orientation program, but student participation is needed to plan and implement a successful program. Finally the question of Engineers' Week's future must be answered. There is much thought and comment about the aims and goals of such an event. A new committee to investigate the future of Engineers' Week is being formed, and we are interested in having non-council members on this committee. Faculty participation is hoped for. All parties interested in this committee should contact me personally.

Hoping to see or talk with many of you within the coming year.

PEACE
Howard M. Kellman
Pres. Engineers' Council

Dear Mr. Editor,

My congratulations for an A+ job on *Mecheleciv* — you and your staff deserve an ECMA Award for originality. Concentrating the talent of our school, you have come up with the best magazine in *Mecheleciv* history. Write on!

I would like to thank the members of the last Engineer's Council. I found heading up this council a most rewarding experience because of the fine people on it. Engineer's Week, Engineers' Ball, D-H House, Graduate Dinner, committee meetings, and council meetings were all the result of a conscious effort on each members part to get something accomplished. I ask you though, how many people just don't care? How many people mock this sort of contribution to the school? How many people just go home and forget about our school? How many people even say "this is *my* school"?

Why don't you who do nothing, stop talking and start doing! You might even find something in it for yourself.

Donald Wallroth

Many of today's students feel a need for communication. One avenue of verbal intercourse has been open for some time at the School of Engineering with its faculty.

THE DAILY COFFEE HOUR

3:00 PM-4:00 PM,

TOMPKINS #206

This noble venture is now under the able direction of Mr. Chris Edler. All engineering students are invited to come and exchange ideas or other assorted trivia.

Y'ALL COME, YA HERE?/////

Signed,
The Panama Coffee Society

A New Look at the New Math

by Alexander Calandra

Some time ago, I received a call from a colleague who asked if I would be the referee on the grading of an examination question. He was about to give a student a zero for his answer to a physics question, while the student claimed he should receive a perfect score and would if the system were not set up against the student. The instructor and the student agreed to submit this to an impartial arbiter, and I was selected.

I went to my colleague's office and read the examination question: "Show how it is possible to determine the height of a tall building with the aid of a barometer."

The student had answered: "Take the barometer to the top of the building, attach a long rope to it, lower the barometer to the street, and then bring it up, measuring the length of the rope. The length of the rope is the height of the building."

I pointed out that the student had a strong case for full credit, since he had answered the question completely and correctly. On the other hand, if full credit were given, it could well contribute to a high grade for the student in his physics course. A high grade is supposed to certify competence in physics, but the answer did not confirm this. I suggested that the student have another try at answering the question. I was not surprised that my colleague agreed, but I was surprised that the student did.

I gave the student six minutes to answer the question, with the warning that his answer should show some knowledge of physics. At the end of five minutes, he had not written anything. I asked if he wished to give up, but he said no. He had many answers to this problem; he was just thinking of the best one. I excused myself for interrupting him, and asked him to please go on. In the next minute, he dashed off his answer which read:

"Take the barometer to the top of the building and lean over the edge of the roof. Drop the barometer, timing its fall with a stopwatch. Then, using the formula $S = \frac{1}{2}at^2$, calculate the height of the building."

At this point, I asked by colleague if he would give up. He conceded, and I gave the student almost full credit.

In leaving my colleague's office, I recalled that the student had said he had other answers to the problem, so I asked him what they were. "Oh, yes," said the student. "There are many ways of getting the height of a tall building with the aid of a barometer. For example, you could take the barometer out on a sunny day and measure the height of the barometer, the length of its shadow, and the length of the shadow of the building, and by the use of a simple proportion, determine the height of the building."

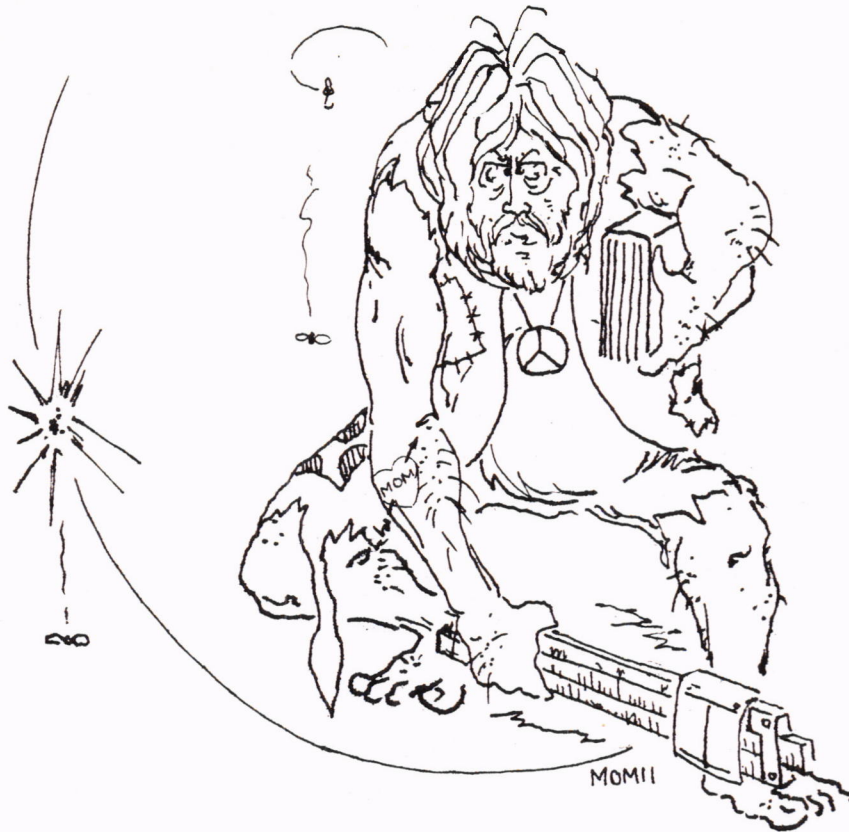
"Fine," I said. "And the others?"

"Yes," said the student. "There is a very basic measurement method that you will like. In this method, you take the barometer and begin to walk up the stairs. As you climb the stairs, you mark off the length of the barometer along the wall. You then count the number of marks, and this will give you the height of the building in barometer units. A very direct method."

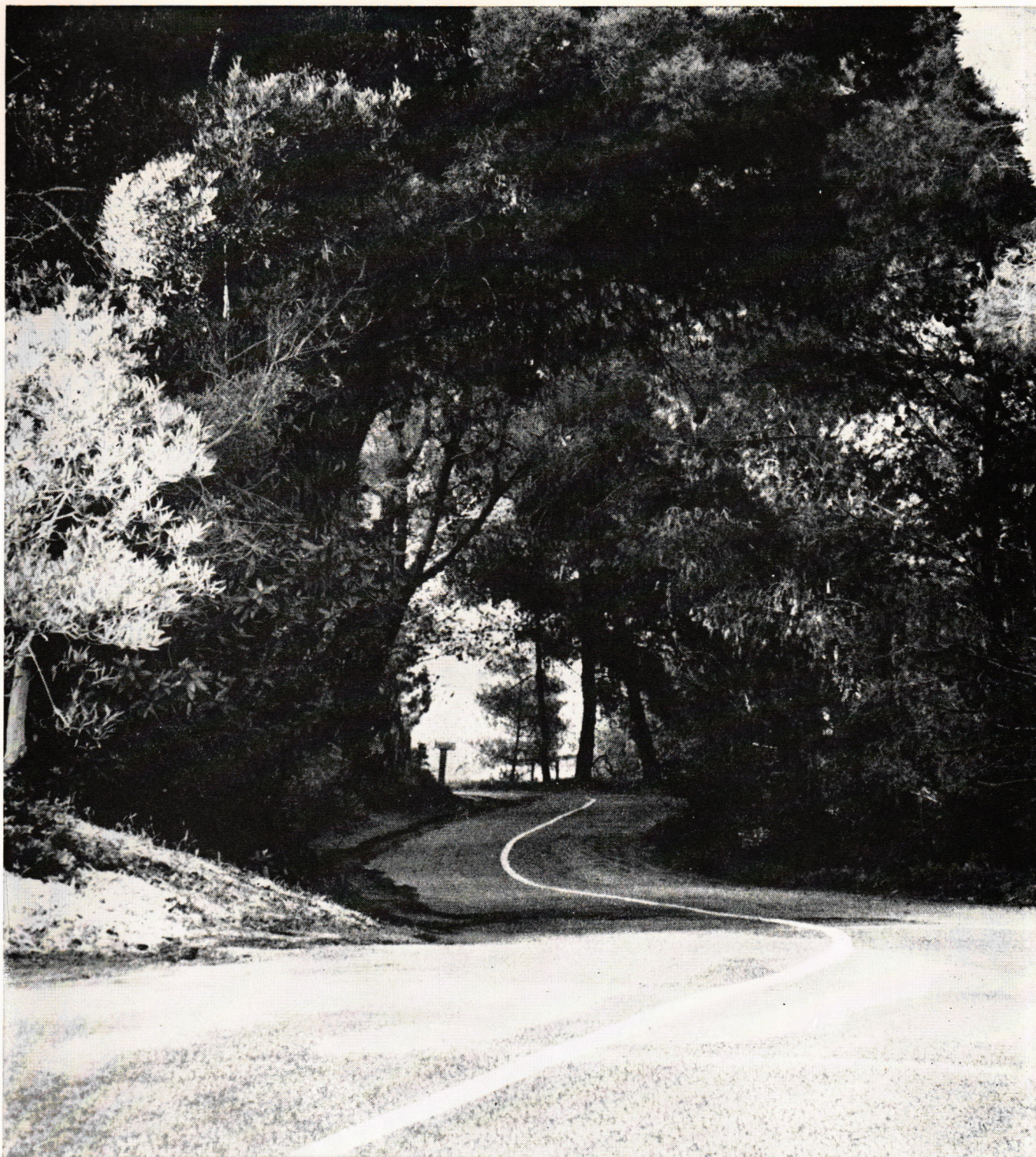
"Of course, if you want a more sophisticated method, you can tie the barometer to the end of a string, swing it as a pendulum, and determine the value of 'g' at the street level and at the top of the building. From the difference between the two values of 'g', the height of the building can, in principle, be calculated."

Finally he concluded, there are many other ways of solving the problem. "Probably the best," he said, "is to take the barometer to the basement and knock on the superintendent's door. When the superintendent answers, you speak to him as follows: 'Mr. Superintendent, here I have a fine barometer. If you will tell me the height of this building, I will give you this barometer.'"

At this point, I asked the student if he really did not know the conventional answer to this question. He admitted that he did, but said that he was fed up with high school and college instructors trying to teach him how to think, to use the "scientific method," and to explore the deep inner logic of the subject in a pedantic way, as is often done in the new mathematics, rather than teaching him the structure of the subject. With this in mind, he decided to revive scholasticism as an academic lark to challenge the Sputnik-panicked classrooms of America.



Senior M.E. Chris Kouts — one of the few students who took time to help during E-Week.



As you can see, you can't see our new telephone lines.

They're underground.

We think America has enough eyesores, so wherever possible we're burying our new cable. And converting old aerial lines.

We already have over 50% of our lines underground. And before we're through we'll have about 92% buried.

We'll never reach 100% because in a few places it's practically impossible to get the cable underground. And in a few other places it's ridiculously expensive.

In the 15 years that we've been burying cable we've gone through hills and high water and turnpikes and mountains.

We've struck oil in Texas (a pipe in someone's backyard). And we've had to get a special repellent to keep gophers from eating the cable.

So if you still see a fair number of telephone poles around, bear with us. Our engineers are working as fast as they can to bury our lines.

And resurrect our scenery.



GENERAL TELEPHONE & ELECTRONICS

730 Third Ave., N.Y., N.Y. 10017

An engineer can cut crime as well as any cop. Maybe better.

Last year, murder was up 7%. Rape was up 17%. Robbery was up 14%.

It's getting to the point where a woman can't show her face on a dark street. And grown men are running scared. Sadly, crime has become a part of our everyday lives.

Where do we turn for help? To police, of course. But why not also to engineers?

Engineers at General Electric set out to develop a more efficient streetlight. And they came up with one of the most efficient crime fighters ever invented.

It's called the Lucalox[®] lamp. It puts twice as much light on a street as any other lamp without any extra operating cost. And wherever Lucalox has gone up, crime has gone down. By 50% or more in city after city.

But that's not all an engineer can do. He might design communications equipment that enables one patrolman to do the job of two. Or a complex of traffic monitors that puts twenty cops back on the beat. Or even a patrol car to do its special jobs in a better way.

It's sometimes hard for people to realize that engineers, with their technology, can solve social problems. But, in fact, some social problems can't be solved any other way.

So if you're an engineer who's bothered by social problems, you're in a unique position to help.

General Electric could use your help. We see more problems around us than we know how to solve. So what we need is more engineers.

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